

CLINICAL OBSTETRICS

10560

CLINICAL OBSTETRICS

BY

SIR A. LAKSHMANASWAMI MUDALIAR
B.A., M.D., LL.D. (HON.), D.Sc. (HON.) F.R.C.O.G., F.A.C.S.,

VICE-CHANCELLOR, UNIVERSITY OF MADRAS, HONORARY OBSTETRICIAN
AND GYNÆCOLOGIST, GOVERNMENT HOSPITAL FOR WOMEN AND
CHILDREN, MADRAS, FORMER PROFESSOR OF OBSTETRICS AND PRINCIPAL,
MADRAS MEDICAL COLLEGE AND FIRST OBSTETRIC PHYSICIAN AND
GYNÆCOLOGIST, GOVERNMENT HOSPITAL FOR WOMEN AND CHILDREN,
EGMORE, MADRAS.

WITH THE ASSISTANCE OF

DR. R. K. K. TAMPAN
B.A., M.B., F.R.C.S.E., M.R.C.O.G.
PROFESSOR OF OBSTETRICS AND GYNÆCOLOGY,
STANLEY MEDICAL COLLEGE, MADRAS

(SECOND EDITION)

WITH 204 TEXT ILLUSTRATIONS AND 9 IN COLOUR

G. S. PRESS MADRAS
1946

FIRST EDITION
Printed in Great Britain by
Oliver and Boyd Ltd., Edinburgh

Authors' Copyright
Price Rs. 21/-

SECOND EDITION
Printed in India by
Q. S. Press, Madras

PREFACE TO THE FIRST EDITION

AN apology is needed for adding still another volume to the many text-books and treatises on Obstetrics. I resisted the temptation to play the rôle of author for long, but because of the constant persuasion of my students and colleagues and the encouragement I received at their hands, I have ventured on this publication. For over twenty-five years it has been my privilege to work in one of the largest of the maternity institutions of the East, and to have been in contact with students and post-graduates from all over India and the Near East. The Government Hospital for Women and Children, Madras, has for long been the centre of clinical instruction for students from the Universities of Madras, Andhra, Lahore, and Lucknow, and for some time from Rangoon and other parts of India. As a post-graduate centre of training it attracts graduates from all the Universities in India, as well as from Hong-Kong, Burma, Federated Malay States, Ceylon, French and Portuguese India.

It is this contact with a large and varied student population and with post-graduates from different schools that has enabled me to realise more clearly the needs of students and practitioners and to appreciate their difficulties. This book is an attempt to put in print the teaching and practice of the clinic. To students, the subject requires to be presented in a manner that will interest them in it and at the same time enable them to appreciate the rationale of the methods of treatment adopted. The need of the practitioner is for a clear-cut presentation of diagnosis and treatment, so that when confronted by a case he is in a position to select a suitable line of treatment. The specialist does not require such detailed guidance. Experience has taught him what to choose and what to discard, what to rely upon and what not to attempt. The beginner, however, needs a guiding hand. I have ventured therefore to lay down definite lines of treatment for each case. This has been based upon my experience and a study of the results of such treatment at the clinic. Honest differences of opinion as to the best line of treatment of some obstetric complications still exist, although the field is gradually being reduced. Fortunately, the efficacy of conservative measures is becoming better appreciated.

Statistics are useful, but anyone who has approached obstetric problems from this point of view realises its limitations. Nowhere is this so evident as in the Tropics. Many of the patients who come with obstetric complications, such as placenta prævia, eclampsia, or

contracted pelvis, also suffer from anæmia, malaria, or nutritional deficiency, diseases which have their own adverse effects on the prognosis of the case. A writer on Clinical Obstetrics in the Tropics cannot but lay emphasis on tropical diseases complicating pregnancy and parturition. Unfortunately, to date, this subject has not received the attention it deserves, and only of late has there been any proper consideration of the problem. I have stressed this subject, so that the practitioner in the Tropics may better understand these complications as they occur in pregnancy and the methods of dealing with them. Much work yet remains to be done in this field.

In describing obstetric operations, I have tried to indicate their limitations. It should be remembered that nature frequently plays the rôle better than any obstetrician. When, however, the need for interference does arise, meticulous care is required at every step of the operation, and it is my hope that the technical details given in this section will be of value.

It is a pleasure to acknowledge the invaluable assistance given by my junior colleagues in the hospital—Drs R. K. K. Tampan, P. V. Venkataswami and M. K. Krishna Menon. Dr R. K. K. Tampan assisted me in the preparation of the greater part of the book before he left to undertake post-graduate studies at Edinburgh. His presence there was most valuable, as he saw the book through the press. Drs Venkataswami and Krishna Menon helped me during the preparation of the latter half of the work and with the revision of the proofs as they came from the press. I also acknowledge the assistance given by the steno-typist, Mr. A. Ranganathan, whose careful and accurate transcription of the work is beyond all praise. I thank Mr P. M. Ratnasabapathi, the artist, for his skill and patience in drawing the illustrations, and Miss M. P. Russell, M.A., who compiled the Index.

My thanks are specially due to Dr John Sturrock, of Edinburgh, who perused the manuscript and offered many valuable suggestions. To the publishers, Messrs Oliver and Boyd, I am indebted. The task of publishing the work of an author so far away from Edinburgh is not an easy one, and I realise the many difficulties that have had to be overcome. Their unfailing courtesy and ready co-operation and the promptness with which they undertook and published this work has placed me under a deep debt of gratitude to them. I thank them most sincerely for their kindness.

A. L. MUDALIAR.

EGMORE, MADRAS,
SOUTH INDIA.

September 1938.

PREFACE TO THE SECOND EDITION

It was intended to bring out the second edition earlier, but the abnormal conditions due to the war, precluded the possibility of any such attempt. Owing to these conditions Messrs Oliver and Boyd who were the printers and publishers of the first edition, regretted their inability to undertake the publication of the second edition. I am deeply thankful to them for the facilities they gave for the book being published in India. Advantage was taken in bringing out this edition, to thoroughly revise the book and rewrite some of the chapters. I wish to acknowledge the great help rendered by Dr. R. K. K. Tampan, B.A., M.B., M.R.C.O.G., F.R.C.S.E., in revising the book, in seeing the book through the press and for valuable advice given. Dr. R. K. K. Tampan was actively associated with me in the publication of the first edition and it is with pleasure that I wish to record the great interest he has once again taken in the publication of this edition. I wish to express my sincere thanks to the G. S. Press for the care with which they have brought out this book in spite of many difficulties.

A. L. MUDALIAR.

EGMORE, MADRAS,
SOUTH INDIA,
May 1946.

CONTENTS

SECTION I

ANATOMY AND PHYSIOLOGY

CHAP.	PAGE
I. THE PELVIS	1
II. THE FEMALE ORGANS OF GENERATION	9
III. PHYSIOLOGY OF THE FEMALE GENERATIVE ORGANS	18
IV. MATURATION AND FERTILISATION OF THE OVUM	20

SECTION II

PHYSIOLOGY OF PREGNANCY

V. MATERNAL CHANGES DUE TO PREGNANCY	27
VI. THE SIGNS, SYMPTOMS AND DIAGNOSIS OF PREGNANCY	32
VII. DIFFERENTIAL DIAGNOSIS OF PREGNANCY	45
VIII. THE FŒTUS IN NORMAL PREGNANCY	55
IX. ANTENATAL CARE	69

SECTION III

PHYSIOLOGY OF LABOUR

X. CAUSATION AND STAGES OF LABOUR	82
XI. THE MECHANISM OF LABOUR	91
XII. CONDUCT OF NORMAL LABOUR	98

SECTION IV

PHYSIOLOGY OF THE PUERPERIUM

XIII. THE PHENOMENA OF THE NORMAL PUERPERIUM	121
XIV. THE CARE OF THE PUERPERIUM	125
XV. CARE OF THE NEW-BORN CHILD	132

SECTION V

PATHOLOGY OF PREGNANCY

CHAP.	PAGE
XXVI. TOXÆMIAS OF PREGNANCY	149
XXVII. DISEASES COMPLICATING PREGNANCY—DISEASES OF THE CARDIO- VASCULAR SYSTEM	190
XXVIII. DISEASES OF THE RESPIRATORY SYSTEM COMPLICATING PREGNANCY	204
XXIX. TROPICAL DISEASES	224
XX. DISEASES OF THE BLOOD	240
XXI. DISEASES AND ABNORMALITIES OF THE OVUM	280
XXII. ABORTION	310
XXIII. ECTOPIC PREGNANCY	328
XXIV. HÆMORRHAGES IN THE THIRD TRIMESTER OF PREGNANCY AND FIRST TWO STAGES OF LABOUR—ABRUPTIO PLACENTÆ	357
XXV. PLACENTA PRÆVIA	370

SECTION VI

PATHOLOGY OF LABOUR

XXVI. DYSTOCIA IN LABOUR	387
XXVII. ABNORMAL CEPHALIC PRESENTATIONS	397
XXVIII. PELVIC PRESENTATIONS	421
XXIX. TRANSVERSE OR OBLIQUE LIE	445
XXX. PRESENTATION AND PROLAPSE OF THE CORD	459
XXXI. MULTIPLE PREGNANCY	469
XXXII. DYSTOCIA DUE TO ANOMALIES OF THE EXPULSIVE FORCES	479
XXXIII. DYSTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS	495
XXXIV. DYSTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS (<i>continued</i>)	503
XXXV. DYSTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS (<i>continued</i>)	524
XXXVI. DYSTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS (<i>continued</i>)	535
XXXVII. CONTRACTED PELVIS	545
XXXVIII. COURSE OF PREGNANCY AND LABOUR IN CONTRACTED PELVIS	560
XXXIX. MANAGEMENT OF LABOUR IN CONTRACTED PELVIS	564
XL. SPECIAL FORMS OF CONTRACTED PELVIS	583
XLI. COMPLICATIONS OF THE THIRD STAGE OF LABOUR	598
XLII. INJURIES TO THE PARTURIENT CANAL	617
XLIII. ASPHYXIA NEONATORUM	640
XLIV. ACCIDENTS AND INJURIES TO THE CHILD	646

SECTION VII

OBSTETRIC OPERATIONS

CHAP.	PAGE
XLV. INTRODUCTION	659
XLVI. FORCEPS	667
XLVII. VERSION	692
XLVIII. CÆSAREAN SECTION	717
XLIX. ENLARGEMENT OF THE PELVIC CAVITY	746
L. INDUCTION OF ABORTION AND LABOUR	754

SECTION VIII

PATHOLOGY OF THE PUERPERIUM

LI. PUERPERAL INFECTION	767
-----------------------------------	-----

APPENDICES

I. TRANSFUSION	816
II. ANÆSTHESIA AND ANALGESIA IN LABOUR	825
III. POST-NATAL CARE	833
IV. ENDOCRINOLOGY IN OBSTETRICS	842
V. RADIOLOGY IN OBSTETRICS	846
INDEX	851

SECTION I
ANATOMY AND PHYSIOLOGY

CHAPTER I
THE PELVIS

THE pelvis is important from the obstetrical point of view, as it forms the canal through which the fœtus has to pass. It may be divided into an upper part, the pelvis major or false pelvis, and a lower part, the pelvis minor or true pelvis, by the linea terminalis, which is formed by the upper border of the first sacral vertebra, the arcuate line of the ilium and the pectineal line of the pubis. The pelvis major, or the upper part of the pelvis, is the expanded portion above this line, while the true pelvis lies below and behind the linea terminalis. This is the part of the pelvis chiefly concerned in child-birth.

The true pelvis may be divided into an inlet, a cavity and an outlet. At the inlet is the brim of the pelvis, which is the oval space corresponding to the plane of the superior strait. The circumference of the inlet is formed by the anterior margin of the base of the sacrum behind, the arcuate and pectineal lines at the sides, and the continuation of the pectineal line into the tubercle and the crest of the pubis in front. The outlet is very irregular in outline. It is bounded behind by the tip of the coccyx, at the sides by the ischial tuberosities and in front by the pubic arch, which is formed by the inferior rami of the ischium and the pubis as these converge from either side towards the pubic symphysis. This outlet is incomplete at the sides between the ischial tuberosity and the coccyx and the sacrum, and here the wide interval is bridged across by the sacro-spinous and the sacro-tuberous ligaments. The cavity is cylindrical in form and extends from the brim or inlet above to the outlet below.

Covering the bone and the ligaments are a series of broad and thick muscles and their investing fasciæ, so that the form of the canal is considerably altered. On each side are the Piriformis and the Coccygeus muscles posteriorly, the Obturator internus laterally and the Levatores ani inferiorly. The Levatores ani and the Coccygei form a musculo-aponeurotic partition called the pelvic diaphragm, separating the pelvis above from the perineum and

vulva below. There are three orifices, the urinary meatus, the genital outlet and the anus, which pierce this diaphragm.

THE DIAMETERS OF THE PELVIS

The measurements of the bony pelvis are important, as they furnish the obstetrician with the dimensions of the somewhat rigid bony canal through which the foetus has to pass. The actual diameters in the living specimen are, however, less, owing to the fact that the bony surfaces are covered with soft parts and muscles which diminish to a certain extent the measurements are obtained in the skeleton.

The external measurements which are usually taken are:—

(1) The *interspinous diameter*, which is the distance between the outer lips of the antero-superior iliac spines, measuring about 10½ ins. (26 cm.).

(2) The *intercristal diameter*, which is the distance between the outer lips of the iliac crests at the widest part, measuring about 11½ ins. (29 cm.).

(3) The *external conjugate* or *diameter of Baudelocque* is the distance between the depression just below the spinous process of the last lumbar vertebra and the most prominent point on the antero-superior surface of the symphysis pubis in the mid-line—about 8 ins. (20 cm.).

(4) The *inter-trochanteric diameter* is the maximum width between the greater trochanters measuring 12½ ins. (31 cm.).

These external measurements afford by no means a correct estimation of the size of the true pelvis, but they help in the majority of cases to give a fairly definite idea of the size and the general configuration of the pelvis.

So far as the true pelvis is concerned, the diameters are generally taken at different planes. The planes usually chosen for this purpose are:—

- (1) The plane of the pelvic inlet.
- (2) The plane of the pelvic outlet.
- (3) The plane of the greatest pelvic dimensions in the cavity.
- (4) The plane of the least pelvic dimensions in the cavity.

The Pelvic Inlet. The diameters of the pelvic inlet are of great obstetrical importance. The chief of these diameters is the *obstetrical conjugate*. This diameter represents the distance between the sacral promontory and the nearest point on the posterior surface of the symphysis pubis. It measures about 4 ins. (10 cm.).

The *anatomical conjugate* or *conjugate vera* (11 cm.) is the distance between the sacral promontory and the upper portion of

the inner surface of the symphysis pubis; while the *diagonal conjugate* is the distance from the promontory of the sacrum to

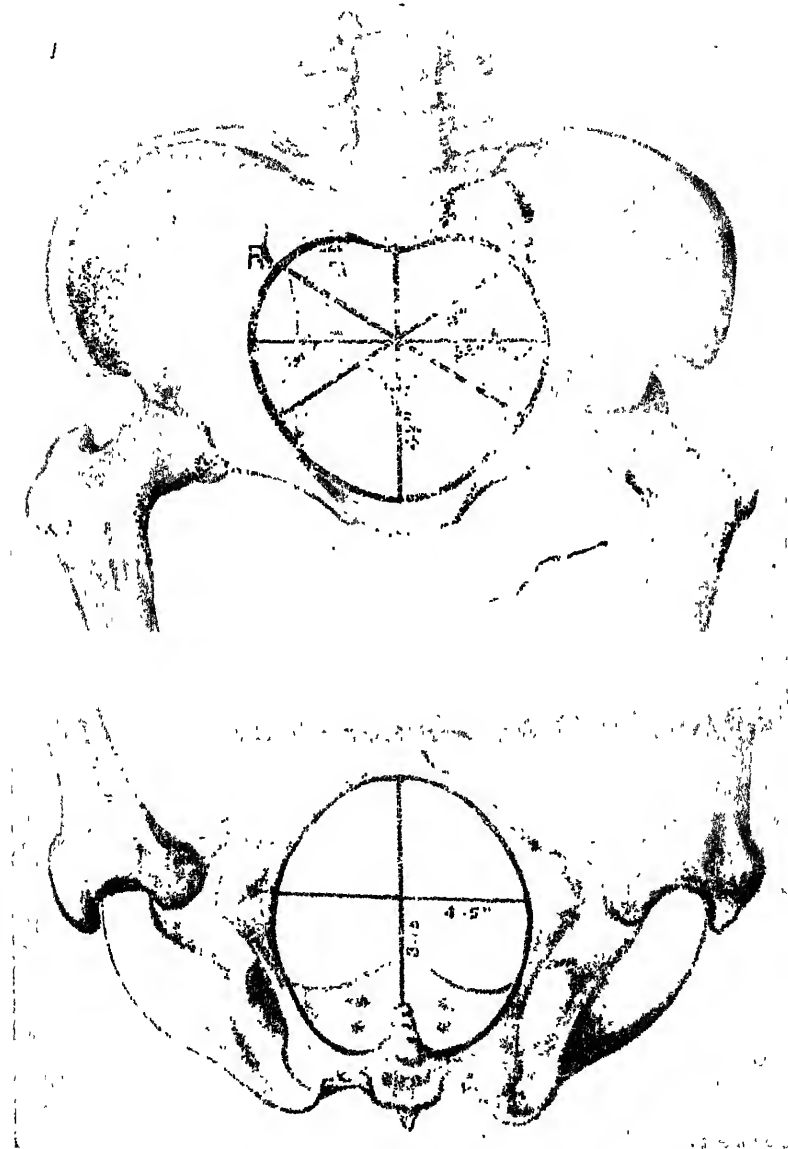


FIG. 1.—Diameters of the inlet and outlet of the female pelvis.

the apex of the pubic arch. The diagonal conjugate is generally of great value in estimating the size of the true conjugate, and this is obtained by subtracting about $\frac{1}{2}$ in. (2 cm.) from the diagonal

conjugate, thus allowing for the inclination, thickness and height of the symphysis pubis.

Other diameters that may be taken at the superior strait are:—

(a) The *transverse diameter*, which represents the greatest width in this plane. It is the distance between the widest apart points on the linea terminalis and measures about $5\frac{1}{2}$ ins. (13.5 cm.) normally.

(b) The *Oblique Diameters, Right and Left*. They run from the sacro-iliac joint of one side to the ilio-pectineal eminence of the opposite side and they are termed right and left, or first and

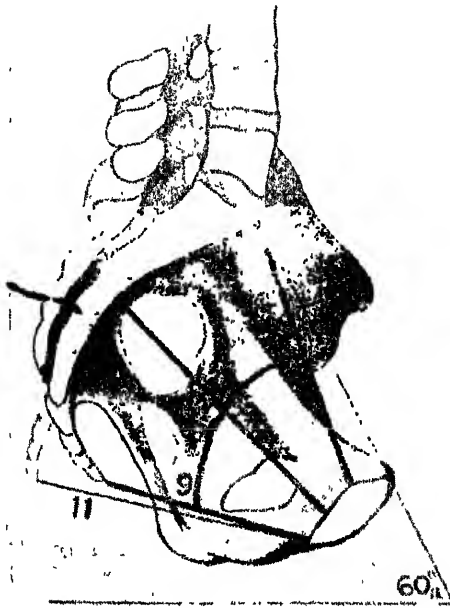


FIG. 2.—Sagittal section of the bony pelvis showing the curve of Carus and the antero-posterior diameters at the inlet, cavity and outlet.

Note the changing position of the coccyx during labour

second—the former being from the right sacro-iliac joint and the latter from the left. These measure about 5 ins. (12.75 cm.).

The Plane of the Outlet. Here, two diameters are taken—the antero-posterior and the transverse.

The *antero-posterior diameter* extends from the apex of the pubic arch to the tip of the coccyx. The coccyx, however, being movable, permits of an increase in the diameter of nearly one inch (2 to 2.5 cm.), so that the length of the diameter increases from $3\frac{1}{2}$ to $4\frac{1}{2}$ ins. (9.5 to 12 cm.) when the coccyx is displaced backwards during delivery.

The *transverse diameter* is the distance between the inner surfaces of the ischial tuberosities and measures about $4\frac{1}{2}$ ins. (11 cm.).

In the cavity there are several planes, but the chief planes which may be reckoned with for purposes of obstetrical consideration are the planes of the greatest and least pelvic dimensions.

The *plane of the greatest pelvic dimensions* passes through the junction of the second and third sacral vertebræ, and laterally through the ischial bones over the middle of the acetabulum. It is nearly circular and its antero-posterior diameter measures 5 ins. (12.5 cm.) while its transverse diameter measures $5\frac{1}{2}$ ins. (12.75 cm.).

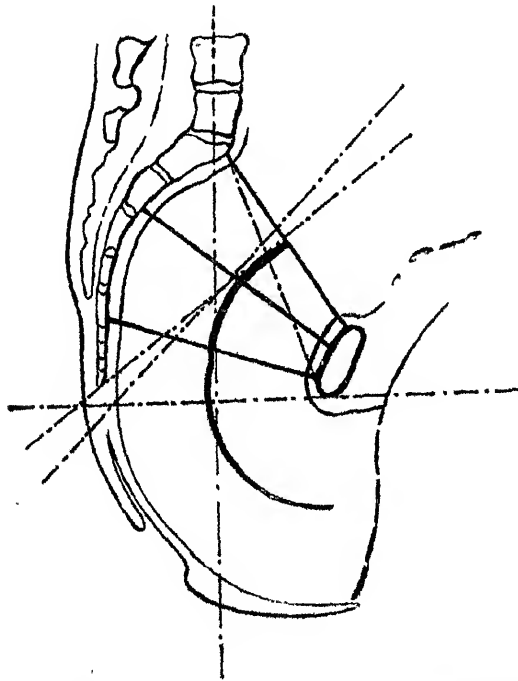


FIG. 3.—Sagittal section of the pelvis showing the planes with their axes at different levels.

The *plane of the least pelvic dimensions* extends through the lower margin of the symphysis pubis, the tip of the sacrum and the ischial spines. The antero-posterior diameter measures about $4\frac{1}{2}$ ins. (11.5 cm.), while the transverse diameter measures about 4 ins. (10.5 cm.).

Pelvic measurements may however vary within a limited degree in different countries. The measurements given above are the average of European and American women. In Southern India,

however, the average measurements are $\frac{1}{2}$ to 1 inch (2 to 2.5 cm.) shorter in all diameters and this should be borne in mind in judging whether a pelvis is contracted or not.

THE JOINTS OF THE PELVIS

The **sacro-iliac joint** is a synovial joint between the auricular surfaces of the sacrum and the ilium. In the adult male, a large

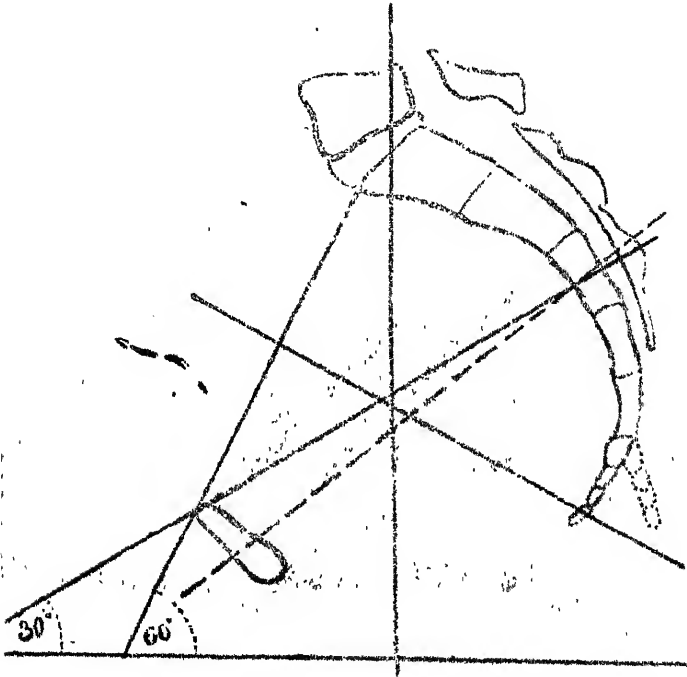


FIG. 4.—Sagittal section of the pelvis showing the inclination of the pelvis.

number of short but strong bundles of fibres enter into the constitution of the sacro-iliac ligaments, and as a result only a small amount of antero-posterior rotatory movement is possible. In the female, after puberty, the range is much greater and it is increased temporarily in the later months of pregnancy.

The Pubic Symphysis. The pubic bones are united to each other by a superior and an inferior pubic ligament and by an interpubic disc of fibro-cartilage.

During pregnancy the pelvic joints and ligaments are relaxed and therefore more mobile. When the foetus is being expelled the force is applied to the front of the sacrum. Upward dislocation

is prevented by the interlocking mechanism of the middle segment of the sacrum. As the foetal head passes the anterior segment, the antero-posterior diameter of the pelvic inlet is slightly enlarged, and when the head reaches low the posterior part of the sacrum is pressed upwards against the resistance of its wedge, the movement being rendered possible only by the laxity of the joints and the stretching of the sacro-tuberos and sacro-spinous ligaments.

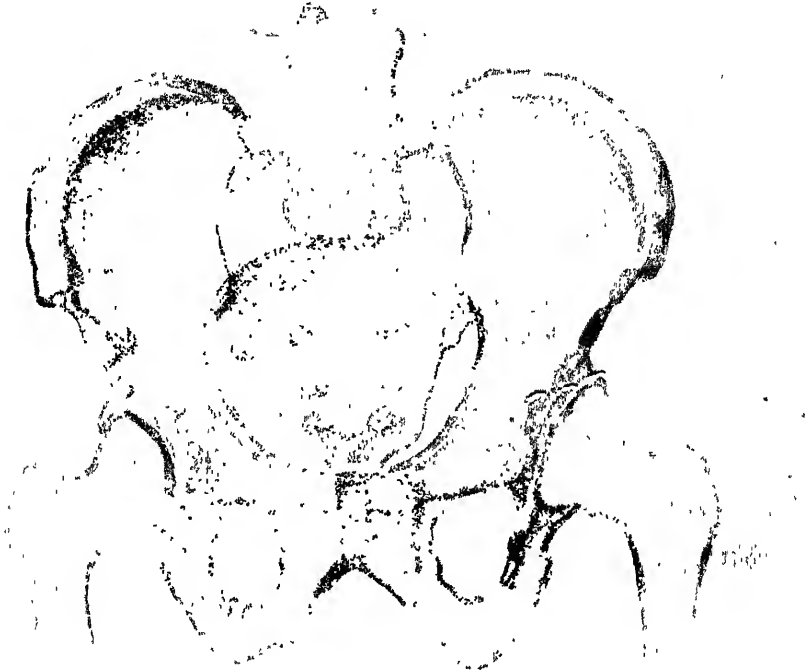


FIG. 5.--Configuration of the male pelvis

These characteristic features of the pelvic joints, particularly during pregnancy, are taken advantage of in obstetrics by making the woman in labour adopt particular positions to facilitate the delivery of the head. The two common positions adopted for increasing the diameters of the pelvis are Walcher's position and the exaggerated lithotomy position.

In Walcher's position the woman is so placed that her buttocks rest on the edge of the table and her legs hang down without any support. In this position there is an increase in the size of the conjugate vera by $\frac{1}{2}$ to 1 in., which may be sufficient to permit the engagement of the presenting part.

In the exaggerated lithotomy position the thighs are sharply flexed over the body, and under these circumstances the antero-

posterior diameter of the outlet is increased by $\frac{1}{2}$ to 1 in. (1 to 2.5 cm), whereas in Walcher's position this diameter is shortened.

DIFFERENCE BETWEEN MALE AND FEMALE PELVIS

The pelvis presents marked differences in the two sexes. In the male the pelvic bones are stronger, heavier and rougher than in the female. The muscular impressions are more marked in the male than in the female, while the iliac fossæ are shallower in the latter. The ischial spines and the tuberosities are more widely separated in the female. The pubic arch is more acute (70° to 75°) in the male, whereas in the female it is more arched (90° to 100°). The curves in the sacrum, both lateral and vertical, are more marked in the female than in the male. The pelvic inlet is rounder in the female and the diameters are generally longer than in the male. The cavity is broad and round in the female, while in the male it is more conical and funnel-shaped. The outlet in the female is much larger on account of the recession of the lower end of the sacrum and the coccyx and the greater distance between ischial tuberosities.

CALDWELL AND MOLOY'S CLASSIFICATION

Caldwell and Moloy have, on the basis of x-ray studies, attempted a morphological classification of the Pelvis. This takes into consideration the anatomical variations in the pelvic architecture presumably caused by racial, sexual or other complex inherited influences rather than by any pathological bony changes. According to this classification, four parent types of pelvic shape could be recognised, viz:—

(1) The Gynecoid type which is the type displaying the accepted female sex characteristics.

(2) The Android type which resembles more the average male pelvis.

(3) The Anthropoid type which resembles the pelvic form of the great apes, and

(4) The Platypelloid type characterised by a broad flat form similar to the flat type of pelvis.

There may however be intermingling of these types when a posterior segment of one of the four parent types is associated with the forepelvis of another. A detailed classification and study of these types of pelvis will be given in a later chapter. The great importance of this recent work lies in the fact that it stresses the need for recognition of certain general types of pelvis which permit of distinct varieties of mechanism in labour.

CHAPTER II
THE FEMALE ORGANS OF GENERATION

The External Genital Organs

THE external generative organs consist of the mons veneris, the labia majora and minora, the clitoris, the vestibule, the hymen and vaginal orifice, the external urethral meatus and the perineum. All these structures are generally included in the term vulva.

The *mons veneris* is the pad of fat lying in front of the pubis, and in the adult female the skin over it is covered by a growth of hair.

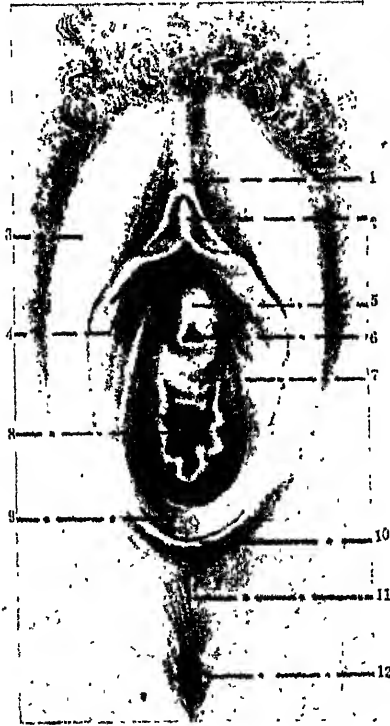


FIG. 6.—External genitalia.

- | | | |
|------------------|---------------------------|-----------------------|
| 1. Prepuce. | 5. Vestibule. | 9. Fossa navicularis. |
| 2. Clitoris. | 6. Urinary meatus. | 10. Fourchette. |
| 3. Labium majus. | 7. Anterior vaginal wall. | 11. Perineum. |
| 4. Labium minus. | 8. Vagina. | 12. Anus. |

The *labia majora* are the two elongated folds of skin projecting downwards and backwards from the mons veneris. They meet in

front in the anterior commissure and posteriorly in the posterior commissure in front of the anus.

The *labia minora* are exposed only when the labia majora are separated. They are two thin folds of skin, one on each side, just within the labia majora. The lower portions of the labia minora fuse across the middle-line to form a fold known as the fourchette, which is usually lacerated during child-birth. Between the fourchette and the vaginal orifice is a boat-like depression, the fossa navicularis.

The *clitoris* is situated in the most anterior portion of the vulva and projects between the labia minora. This corresponds to the penis in the male.

The *vestibule* is the triangular surface which extends from the clitoris above, to the anterior margin of the hymen below, and laterally to the labia minora. At the centre of the vestibule is the opening of the urethra. The vestibule is generally concealed by the labia in the natural condition.

The *Hymen*. This is an incomplete septum of mucous membrane which closes the vaginal orifice. In the virgin the aperture in it is usually a small longitudinal slit, running from behind forwards. The membrane may vary in shape, but is usually circular or somewhat crescentic. The hymen is usually ruptured at the consummation of marriage, and is therefore considered one of the signs of virginity when it is intact. This is not, however, absolutely certain evidence of virginity. At child-birth the hymen is extensively lacerated, and is later represented by a large number of cicatrised nodules of varying sizes, called the *caruncular myrtiformes*.

The *perineum* is the wedge-shaped area between the lower end of the posterior wall of the vagina and the anterior anal wall.

The *Bartholin's gland* are a pair of small globular structures, situated one on either side of the vaginal orifice and covered by the posterior end of the bulb of the vestibule. They are compound racemose glands and lead into a narrow duct which opens below the hymen on the inner surface of the labium minus near its posterior end.

The Internal Genital Organs

These are the vagina, uterus, Fallopian tubes and the ovaries.

THE VAGINA

This is a tube extending from the vulva outside to the uterus, and is situated between the bladder in front and the rectum behind. It is directed upwards and backwards and is slightly

curved posteriorly. The vaginal canal is a transverse or H-shaped slit with the lower end somewhat narrower than the upper end. The cervix dips into the vaginal canal, and the vault of the vagina which surrounds the cervix consists of four pouches or fornices: the anterior fornix in close relation with the bladder; the posterior fornix, which is a *cul-de-sac* in relation with the pouch of Douglas and the rectum; and the right and left fornices, which are in close relation with the ureter and uterine artery of the side.

Anteriorly, the vagina is in relation with the bladder and the urethra. A septum intervenes which contains a considerable amount of musculo-fascial tissue. Laterally, the vagina is supported by the free edges of the Levatores ani muscles. Posteriorly, in its upper third, the vagina is related to the pouch of Douglas and is therefore in close contact with the peritoneal cavity, being separated from it only by a thin septum formed by the vaginal wall and the peritoneum. The lower portion of the vagina is in relation with the rectum and perineal body.

The vagina is lined by stratified squamous epithelium.

THE UTERUS

The uterus is a hollow organ situated in the pelvis between the bladder in front and the rectum behind. It is pear-shaped in the



FIG. 7.—The uterus and its appendages (posterior view).

Section of the left half shows the cavity of the uterus and lumen of the Fallopian tube.

unimpregnated condition and is partially covered by peritoneum and lined by a mucous membrane, the endometrium. It consists

in two unequal parts, the corpus or body and the neck or cervix. The Fallopian tubes come off from either side of the uterus at the junction of the superior and lateral margins. The portion of the uterus above the level of the insertions of the Fallopian tubes is known as the fundus of the uterus. It is convex or dome-shaped and is directly continuous with the rest of the body. The cavity of the uterus is triangular in shape with the base upwards, and the apex situated at the junction of the body with the cervix. In the non-gravid condition the length of the cavity is about 1½ to 2 ins. The endometrium, or the lining membrane, is composed of a cellular stroma of embryonic cells in which lie simple tubular glands and is covered by a columnar ciliated epithelium.

CORPUS UTERI

The wall of the uterine body is composed of three layers, the serous, muscular and mucous. The serous layer is formed by the peritoneum which covers the anterior two third and the whole of the posterior surface of the uterus. The mucous layer, known as the endometrium is attached directly to the muscular layer. There are a large number of small tubular glands—the uterine glands—projecting down from the surface of the endometrium.

The greater part of the uterus is made up of non-striated muscle united by connective tissue in which are found elastic fibres. The body of the uterus along with the cervix undergoes marked changes in pregnancy and during labour.

THE CERVIX UTERI

This is the portion of the uterus which lies below the isthmus and the internal os. It is divided into two parts, the supravaginal and the infravaginal portions. The supravaginal portion is covered on its posterior surface by peritoneum, but on the anterior and lateral surfaces it is in contact with extraperitoneal connective tissue. The cervix is composed of connective tissue in which are many non-striated muscle fibres, many vessels and some amount of elastic tissue. The lining membrane is covered by columnar epithelium and contains compound racemose glands. In the non-gravid condition the length of the cervical canal is about one inch from the internal to the external os. The external os is nearly circular in nulliparous women, but after delivery the orifice may become a transverse slit. In some cases, even in nulliparæ, the orifice is transverse.

LIGAMENTS OF THE UTERUS

Certain ligaments keep the uterus in position. These are the broad ligaments, the round ligaments, the utero-sacral ligaments, and Mackenrodt's ligaments, or the ligamenta transversalia colli.

The *broad ligament* on each side is a double layer of peritoneum directed from the lateral margin of the uterus to the lateral wall of the pelvis. It serves to divide the pelvic cavity into an anterior and a posterior compartment. The two layers of peritoneum, which form the broad ligament, enclose extraperitoneal connective tissue, the Fallopian tube, the round ligament and true ligament of the ovary, the par-oophoron and the ep-oophoron, and certain blood vessels, nerves and lymphatics.

The *round ligaments* extend on either side from the antero-lateral angle of the uterus just below and in front of the insertion of the Fallopian tubes. They are enclosed between the serous layers of the broad ligaments and pass laterally through the internal abdominal inguinal rings into the inguinal canals, and finally merge in the labia majora.

The *utero-sacral ligaments* are two condensations of visceral pelvic fascia extending from the posterior and upper portion of the cervix to the fascia covering the second and third sacral vertebrae.

The *ligamenta transversalia colli*, or *Mackenrodt's ligaments*, also spoken of as the *cardinal ligaments*, are thickened bands of fibro-muscular tissue stretching across the pelvis. They run in the base of the broad ligaments, being attached medially to the side of the cervix uteri and vaginal vault, and laterally to the side wall of the pelvis.

PERITONEAL RELATIONS

The pelvic peritoneum is a continuation of the peritoneal investment of the anterior wall of the abdomen. As seen in a mesial sagittal section it will be found that the peritoneal investment, as it comes along the posterior aspect of the anterior abdominal wall, behind the symphysis pubis, arches over the fundus of the bladder and a portion of the posterior surface, and is then reflected over the upper two-thirds of the anterior surface of the body of the uterus, covers the fundus of the uterus, and passes along the whole of the posterior surface of the body of the uterus, and is thereafter continued downwards over the posterior surface of the supravaginal portion of the cervix and the upper third of the posterior vaginal wall. From there it is carried on to the anterior rectal wall, and in its lower part covers only the anterior wall of the rectum; whilst higher up it covers the lateral

wall also, and at the level of the promontory it passes on to the peritoneum of the posterior abdominal parietes. As the peritoneum is reflected on either side of the uterus it is prolonged laterally in a fan-shaped manner, forming the broad ligament on either side. The pouch formed by the reflection of the peritoneum from the posterior surface of the bladder on to the anterior surface of the body of the uterus is known as the utero-vesical pouch; whilst the pouch of Douglas, which is much deeper, is

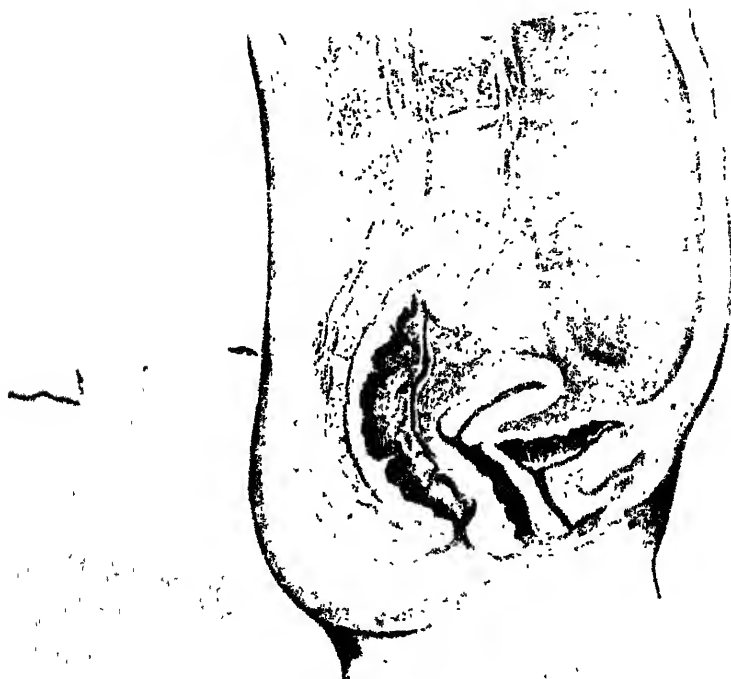


FIG. 8.—Sagittal section of female pelvis with the peritoneal relations.

formed by the reflection of the peritoneum which covers the posterior wall of the uterus and the supravaginal portion of the cervix to the anterior rectal wall. The utero-sacral ligaments, posteriorly, divide this pouch into three compartments, a mesial deeper fossa, which is properly spoken of as the pouch of Douglas, and two lateral shallow fossæ, the para-rectal fossæ.

THE FALLOPIAN TUBES

Lying in the medial four-fifths of the upper border of the broad ligament the Fallopian or uterine tubes are situated one on either side of the uterus. They are attached to the uterine cornu and measure in length about 4 to 4½ ins. They are convoluted and their free ends are near the ovaries.

The Fallopian tube may be divided into four portions—the interstitial, isthmal, ampullary and infundibular portions. The interstitial portion is that part of the tube which is included within the muscular wall of the uterus. The isthmus is the narrowest portion immediately adjacent to the uterus. The ampulla is the widest part of the tube and ends in a fimbriated end, which is the outermost end of the tube and is known as the infundibulum. This opens directly into the peritoneal cavity by an ostium, which is surrounded by a number of radiating fimbriæ.

The wall of the tube consists of two layers of muscle—the inner circular and the outer longitudinal. Externally is the peritoneum of the broad ligament. The lumen of the tube is lined by mucous membrane which is thrown into folds called plicæ, consisting of a fibrous tissue core lined by a single layer of ciliated epithelium.

THE OVARIES

These are two almond-shaped bodies, which are situated at the outer extremity of the Fallopian tube and attached to the posterior surface of the broad ligament by the mesovarium.

The ovarian ligament extends from the upper end of the lateral wall of the uterus just below and behind the insertion of the Fallopian tube, to the inner or uterine pole of the ovary.

The ovary is divided into three regions—the hilum, the medulla and the cortex. The hilum is the small area composed of connective tissue and unstriped muscle fibres through which the ovarian vessels, lymphatics and nerves pass into the ovary from the broad ligament. The cortex of the ovary is the outer layer where the Graafian follicles are situated. Its surface is lined by a single layer of cells called the germinal epithelium, continuous at the hilum with the peritoneum of the broad ligament. The ovary has no peritoneal covering. The medullary portion is the central portion of the ovary, composed of connective tissue and a large number of blood vessels.

BLOOD VESSELS, LYMPHATICS AND NERVES

Blood Vessels. The pelvic organs in the female are supplied by the ovarian, uterine and vaginal arteries. The vulva is supplied by the internal pudic artery. The ovarian artery is a branch of the abdominal aorta. It runs along the upper part of the broad ligament to the uterine cornu, where it anastomoses with the terminal branch of the uterine artery. It supplies the ovary and the Fallopian tube.

The uterine artery arises from the anterior branch of the internal iliac artery. It runs downwards, forwards and medially in the base of the broad ligament, crosses above the ureter and passes to the side of the uterus. Just before the main branch turns abruptly upwards a small branch is given off, the cervico-vaginal artery, which supplies the lower portion of the cervix and the

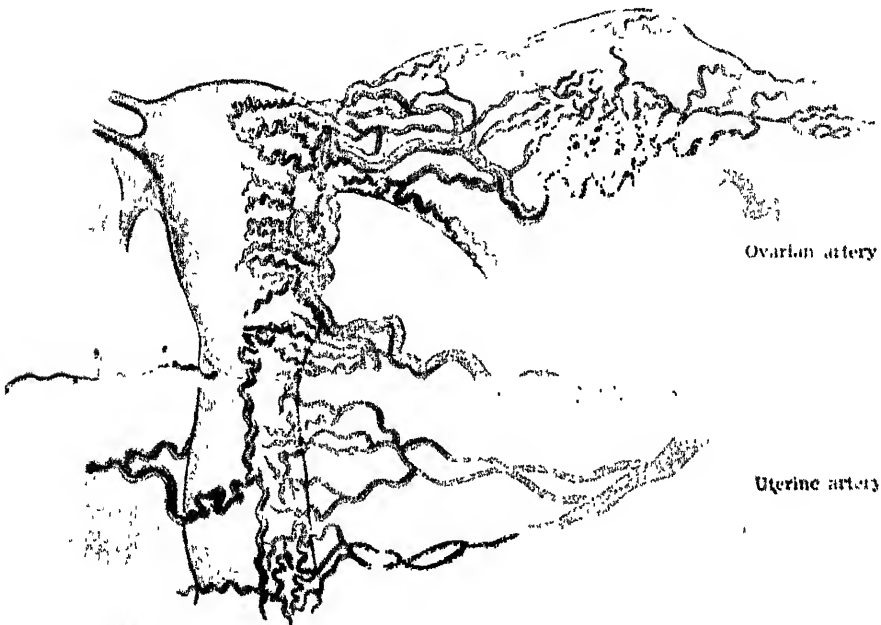


FIG. 9.—Blood supply of the internal genitalia

upper portion of the vagina. The main artery, which proceeds upwards in the broad ligament along the lateral border of the uterus, gives off many branches, and finally sends a branch to anastomose with the ovarian artery; while a second one passes in the meso-salpinx supplying the Fallopian tube, and a third goes to the fundus.

The veins which emerge from the uterine fundus, Fallopian tube and ovary form the pampiniform plexus. From this two ovarian veins emerge, which later fuse to form the single ovarian vein, which on the left side joins the renal vein and on the right side the inferior vena cava. The uterine veins accompany the uterine artery and end in the corresponding internal iliac vein.

The vaginal artery springs from the anterior division of the internal iliac artery below the uterine artery. It supplies the vagina, while some twigs anastomose with the uterine artery. The

vaginal veins form a plexus round the vagina and empty into the internal iliac vein.

The internal pudic artery supplies the vulva and the perineum, and the accompanying veins pass into the inferior hæmorrhoidal and inferior vesical plexus.

The Lymphatics. There are a large number of chains of glands which receive the lymphatics from various portions of the female generative tract. These glands are grouped as the aortic glands, the common iliac glands, the external iliac glands, the internal iliac glands, the inguinal glands and the sacral glands. The aortic glands drain the lymphatics from the ovary, Fallopian tube and the body of the uterus. They also drain the lymphatics coming from the iliac glands. The common iliac glands, which are situated along the common iliac artery on either side, receive the lymphatic vessels from the external and internal iliac glands and directly from the viscera. Lymphatics from this chain pass to the aortic glands. The external iliac glands are related to the external iliac vessels, and are situated in three chains—the outer, middle and inner. They receive the lymphatics from the femoral glands, the inguinal glands, the clitoris, the bladder, the upper part of the vagina and the cervix uteri. From the external iliac glands, lymphatics pass on to the common iliac glands. The internal iliac glands are in relationship with the internal iliac artery and receive the lymph from the lower portion of the rectum, the bladder, cervix and upper part of the vagina. From these, lymphatics pass to the common iliac glands. The inguinal glands drain the lymphatics from the perineum, anus, vulva and the lower part of the vagina. A few lymphatic vessels from the fundus of the uterus, which accompany the round ligaments, also drain into this set of glands. From here the lymphatics pass on to the external iliac glands. The sacral glands lie in front of the sacrum on the inner side of the second and third sacral foramina, and from them lymphatics pass on to the common iliac glands.

INNERVATION

The nerve supply of the uterus is derived principally from the sympathetic nervous system but partly from the cerebro spinal and parasympathetic systems. The parasympathetic or autonomic system is represented on either side by the pelvic nerve which consists of fibres from the second, third and fourth sacral nerves and ends in the ganglion of Frankenhauser. The sympathetic nerves arise from the Hypogastric plexus which is situated just below the promontory of the sacrum and in front of the Aorta and its division. Both the sympathetic and parasympathetic nerves supply the uterus, bladder and upper part of the vagina.

CHAPTER III

PHYSIOLOGY OF THE FEMALE GENERATIVE ORGANS

THE organs of generation do not mature till the second decade of life, and after a certain period, which varies with different individuals, some of the functions cease. The essential organ of reproduction in the female is the ovary, as here are produced the ova. The accessory organs include the oviducts or Fallopian tubes, the uterus in which the fertilised ovum is retained during the period of pregnancy and where it develops, and the vagina, which is the passage through which the spermatozoa are enabled to pass upwards. The mammary glands, which undergo a special development during pregnancy, may also be considered as accessory organs. They serve for the nourishment of the infant during the initial period of its extra-uterine life.

MENSTRUATION AND OVULATION

There are two processes which occur regularly in women generally between the ages of fifteen and forty-five to fifty; these are ovulation and menstruation.

Menstruation is the periodic flow of blood and mucus from the uterus which begins at a particular age and persists for thirty to thirty-five years. The age at which menstruation begins varies with individuals and in different countries. The average age in European countries is about fourteen to fifteen years, while in tropical countries and in the East generally, it occurs one or two years earlier, varying between the ages of eleven and fourteen.

In the majority of women there is a definite periodicity in the flow, which generally occurs once in about twenty-eight days. The duration of the flow is from three to five days, and the amount of blood lost varies with individuals, the average being 4 to 8 oz. Menstruation is suspended during pregnancy and lactation.

Before the first menstruation other signs of puberty, that is, of approaching sexual maturity, are usually observed. These include rapid growth, with changes in the skeleton leading to the typically feminine type of pelvis, the development of the mammary glands and the growth of hair on the pubes. At the same time the mental characteristics typical of the sex manifest themselves.

During the menstrual period there are often disturbances of the other functions of the body and a general disinclination for exertion.

Ovulation. The ovaries are responsible not only for the production of the ova, but also for certain hormones or internal

secretions which have got a bearing on the physiology of the individual. At birth the ovary consists of a stroma of spindle-shaped cells and is covered by a layer of cubical epithelium—the germinal epithelium. Embedded in the stroma, and especially just underneath the epithelium, are a large number of primordial follicles. About 70,000 follicles are to be found in the ovary of the new-born child, and during the woman's life some 500 of these mature and become ripe; the remainder are destroyed.

The primordial follicles develop into fully-formed Graafian follicles. This maturation of the follicles first occurs with the onset of puberty. At one point in the mass of cells surrounding the ovum a cavity appears filled with fluid—the liquor folliculi. With increasing size of the Graafian follicle, the cortical stroma covering it becomes progressively thinner and more vascular and the ovum moves to a position in the follicle adjacent to the outer surface of the ovary. At certain periods or under certain conditions the follicle ruptures and the liquor folliculi, with the ovum, is discharged into the peritoneal cavity. The ovum, thus set free, is directed into the open end of the Fallopian tube by the current set up by the cilia with which the epithelium is furnished. There may be other directive forces besides this, for when the ovary on one side is removed, and the Fallopian tube on the other side is closed, pregnancy, although less likely to occur, is far from infrequent. After the discharge of the ovum the remaining portions of the follicle undergo a characteristic series of changes, which result in the production of the *corpus luteum*. Immediately after the rupture, the cells of the *membrana granulosa* rapidly increase in size, a few of them undergoing mitotic division, so that a dense mass of cells is formed, nearly filling the original follicle. The *corpus luteum* attains its greatest size in the human species about the nineteenth day of the menstrual cycle, at which stage it has a purplish colour. It then gradually undergoes regressive changes. If, however, the ovum, which has been discharged, undergoes fertilisation and pregnancy results, the *corpus luteum* continues to grow for a considerable time and attains its largest size at about the third month, though it does not disappear until after the end of pregnancy. Occasionally the more fully developed *corpus luteum* of pregnancy is often spoken of as the true *corpus luteum*, and is distinguished from the spurious *corpus luteum* of menstruation or of ovulation, without fertilisation. There is, however, no essential difference other than that of size between these two kinds of *corpora lutea*. It is probable that in the human female ovulation occurs as a rule alternately in each of the two ovaries once every four weeks during the thirty or thirty-five years of sexual life.

The Relation of Ovulation to Menstruation. There is no doubt that menstruation normally depends on the functional

activity of the ovary. Its onset coincides with the first production of ripe ova in the ovary, and it ceases with the cessation of ovulation at the climacteric or menopause. In cases where the ovaries have been removed before puberty menstruation does not occur. Removal of both ovaries during adult life generally brings about a premature menopause.

It seems probable that the ripening and discharge of the ova in the human ovary occur about the thirteenth to the seventeenth day of the menstrual cycle, taking the first day of menstruation as the beginning of this cycle.

CHAPTER IV

MATURATION AND FERTILISATION OF THE OVUM

THE spermatozoa, which are introduced into the female generative tract by the act of copulation, ultimately come in contact with and fertilise the ovum discharged from the ovary by the bursting of the Graafian follicle. Before the ovum can be fertilised it must undergo a process of maturation or ripening. This consists of a preliminary stage of growth, during which the ovum increases greatly in size. During this stage of growth, changes occur both in the nucleus and in the cytoplasm. The nuclear changes affect chiefly its chromatin content. The chromosomes unite with one another in pairs, usually in their long axis, so that the number is reduced by half, each however representing a double chromosome. The process is termed conjugation of the chromosome. The number of chromosomes found in the nucleus is constant for all the cells in an animal of any given species, and in man the number is probably forty-eight.

The changes in the cytoplasm, which mark the period of growth, result in a great increase in the size of the cell.

Having passed through this period of growth further changes occur in the ovum near its upper pole. The double chromosomes arrange themselves in an equatorial plane with reference to the modified spindle which is placed radially. The chromosomes divide, one half of them pass centrally while the other half pass outwards, forming a projection at the upper pole of the ovum, which becomes separated off to form the *first polar body*.

The division of the cytoplasm, unlike the division of the nucleus, is unequal, so that the polar body carries with it only a small part of the cytoplasmic content of the ovum. There is a further division of the cell in a like manner and a *second polar body* is formed and cast off. The ovum has now become mature,

the characteristics of which are that the number of chromosomes are reduced by one half and that the size is greater.

Fertilisation. Fertilisation consists in the union of a spermatozoon with a mature ovum. This generally takes place in the Fallopian tube. In the human subject fertility is probably highest about fourteen to eighteen days after the commencement of menstruation and lowest about a week before its onset. A spermatozoon pierces the zona pellucida and enters the mature ovum, the point of entry being closed at once to prevent the admission of other spermatozoa. At the same time the spermatozoon sheds its tail, while its head and body become altered to form the male pro-nucleus. The two pro-nuclei fuse with each other and give rise to the segmentation nucleus. This step is the essential feature of fertilisation. The nucleus so formed now possesses the number of chromosomes which is typical for the species, one half of them being derived from the ovum and one half from the spermatozoon.

With the arrival of the fertilised ovum in the uterus, extensive changes begin in this and in the neighbouring organs of generation. The walls of the uterus hypertrophy. There is a great growth of the blood vessels, which have to supply not only the growing wall of the uterus but also the nutritional needs of the developing foetus through a special organ—the placenta.

After fertilisation the ovum undergoes a series of cell divisions, which follow one another in close succession, until a small sphere of cells is formed. This is called the *morula*, and the stage is called the *morula stage* or the *mulberry stage*. The process of differentiation now commences in the cells of the morula. Its outermost layer constitutes the trophoblast and cells in its interior differentiate into a closely packed inner cell mass and a loosely arranged primary mesoderm. The cells of the trophoblast differentiate further into an inner cellular layer, which is termed the cytotrophoblast or Langhans' layer, and an outer syncytial layer termed the plasmodi-trophoblast. The plasmodi-trophoblast throws out a large number of irregular villous processes which exert a histolytic action on the uterine mucosa, and not only effect embedding of the ovum in the maternal tissues but also, a little later, provide the channels by means of which the developing embryo is enabled to draw nourishment from the maternal blood. While these changes are occurring in the trophoblast, the inner mass undergoes differentiation which results in the formation of two hollow vesicles. Of the two vesicles so formed, one remains in close contact with the trophoblast and constitutes the amnio-embryonic vesicle, the other is placed more centrally and is usually referred to as the yolk-sac.

The Differentiation of the Embryonic Area. The embryonic area shows no distinguishing features in its earlier stages. At first merely circular, its outline rapidly alters and becomes oval, indicating the long axis of the body. In the middle of the embryonic area a slight depression appears, which is known as the primitive streak, and on either side of it there is a slight elevation, the primitive fold. The presence of the primitive streak indicates that rapid growth is occurring throughout its site. Shortly afterwards a second thickening occurs—the medullary plate—from which by far the greater part of the central nervous system is developed. The raised ridges constitute the neural folds, and the groove which separates them is the neural groove. From this primitive node a rod-like process of cells grows headwards in the median plane and separates the floor of the neural groove from the subjacent roof of the entodermal vesicle. This is termed the head process and it is the forerunner of the skeletal axis of the body. The head process becomes very intimately connected with the underlying entoderm, and both the cells forming the floor of the canal of the head process and the entoderm cells in contact with them break down, so that the canal communicates freely with the vesicle and at its caudal end a communication is established between the entodermal vesicle or arc-enteron and the amniotic cavity. This connection is termed the *neurenteric canal*. At a later stage the three layers in the human embryo develop, contributing to the forming of systems and organs which show distinct functional differences. These three layers are the ectoderm, the entoderm and the mesoderm.

Further details regarding the development of the embryo can be found in any book on Embryology.

The Foetal Membranes and the Placenta. The amnion is a membranous sac which surrounds and protects the embryo. A fluid termed *liquor amnii* appears within the amniotic cavity and increases steadily in amount, so that the sac gradually expands and encroaches on the cavity of the extra-embryonic coelom. This expansion continues until the extra-embryonic coelom is obliterated entirely, except for a small portion which is included within the umbilical cord. The liquor amnii increases in quantity up to the sixth or seventh month of pregnancy and then diminishes somewhat. At the end of pregnancy it amounts to about two pints. It contains less than 2 per cent. of solids, consisting of urea and other extractives, inorganic salts, a small amount of protein and frequently a trace of sugar.

The *liquor amnii* fulfils the following purposes:—

- (1) It allows of the free movement of the foetus, particularly during the latter half of pregnancy.

- (2) It diminishes the risks to the foetus of injury from without.
- (3) It is a source of nourishment to the foetus.
- (4) It helps to maintain the foetal temperature at a constant level.
- (5) It prevents the formation of adhesions with the amnion.
- (6) During labour it helps to dilate the passages, to wash out the vagina, and thus to keep the parts sterile both by its mechanical and bactericidal properties.

The Umbilical Cord. This is formed by an outer covering of amniotic ectoderm, containing in its interior the vitello-intestinal duct and the yolk-sac or umbilical vesicle. The umbilical cord incorporates within itself the body stalk and its contained umbilical vessels (two arteries and one vein) and the allantois. It is spirally

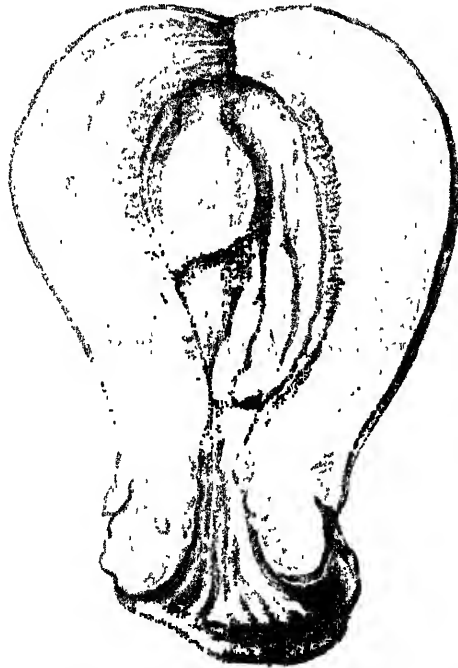


Fig. 10.—Early embedding of the ovum (in section).

twisted and it increases in length, so that at the end of pregnancy it is about 50 cm. long.

The chorion consists of two layers, an outer of trophoblast, and an inner of primary mesenchyme. The trophoblast, as already stated, undergoes rapid proliferation and forms on the surface of the chorion numerous processes which are known as the primary chorionic villi. These increase in size and ramify, and the chorionic

mesenchyme carrying branches of the umbilical vessels grows into them, and in this way they are converted into secondary chorionic villi. With the growth of the embryo and the expansion of the amniotic cavity, the decidua capsularis is thinned and compressed, the circulation through it is gradually cut off, and the villi of the corresponding part of the chorion atrophy and disappear. This portion of the chorion becomes smooth, and as it takes no share in the formation of the placenta, is sometimes termed the non-placental part of the chorion. On the other hand, the villi on that part of the chorion which is in contact with the decidua basalis, increase greatly in size and complexity, and hence this part is named the chorion frondosum.

The Placenta. This connects the foetus to the uterine wall and is the organ by means of which the nutritive, respiratory and excretory functions of the foetus are carried on.

THE PHYSIOLOGY OF THE FŒTUS

During the early period of its development the fertilised ovum is dependent for its nourishment on the remains of the cells of the *discus proligerus* adhering to it or on the fluid of the Fallopian tube into which it is immersed. From the second week onwards blood vessels traverse the chorionic villi and come into close relation with the maternal blood, and from this period the whole growth of the foetus is to be maintained by a special development of these connections in the placenta.

In the fully formed foetus, blood passes from the foetus to the placenta by the umbilical arteries and is returned by the umbilical vein. There is no communication between foetal and maternal circulations. The placenta represents the foetal organ of respiration, nutrition and excretion. Thus the umbilical arteries carry to the placenta dark venous blood which, in this organ, loses its carbonic acid and takes up oxygen, so that the blood of the umbilical vein is arterial in colour. The oxygen requirements of the foetus are, however, very small. It is protected from all loss of heat, movements are sluggish, and the only oxidative processes are those required for the building up of the developing tissues. On the other hand, the foetus has need of a rich supply of foodstuffs which it must obtain through the placental circulation.

THE FŒTAL CIRCULATION

The foetal circulation differs from adult circulation in some material respects. The blood-vessels traverse the umbilical cord and enter the umbilicus of the foetus. Here the umbilical vein, which carries oxygenated blood from the placenta, passes directly

into the liver, but before doing so it gives off a branch—the ductus venosus—which carries the greater part of the blood directly into the inferior vena cava and thence to the right auricle. Here the blood stream impinges on the Eustachian valve and is directed through the foramen ovale into the left auricle, whence it passes into the left ventricle, to be driven into the aorta. As this arterial blood passes into the inferior vena cava through the ductus venosus, it is of course mixed with the venous blood returning from the lower limbs and the lower part of the trunk. The aorta gives off the three main branches—the Innominate, left Common Carotid and left Subclavian—for the supply of the head and neck and superior extremities, and then descends as the Thoracic Aorta, passing eventually into the abdominal cavity as the Abdominal

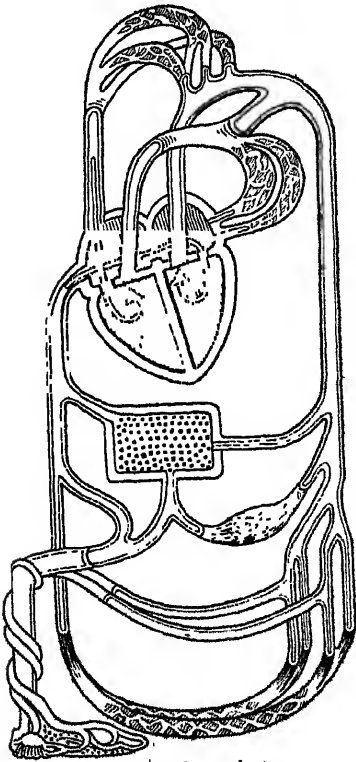


FIG. 11.—Schematic representation of the fetal circulation

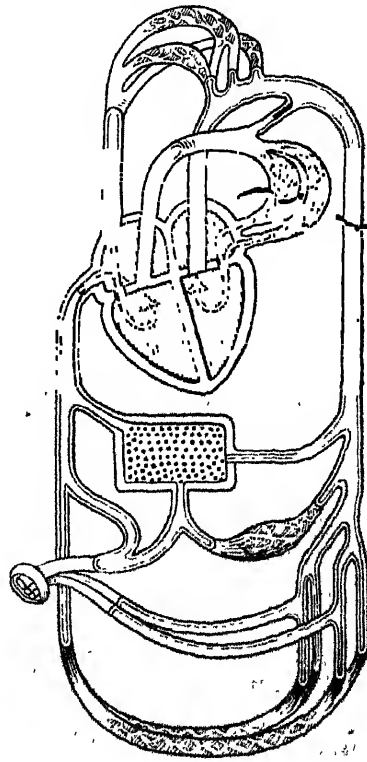


FIG. 12.—Schematic representation of the changes in circulation after birth of the child.

Aorta. The venous blood from the head and neck and superior extremities is returned to the right auricle by the superior vena cava, thence to the right ventricle, by which it is driven into the pulmonary artery. Only a small part of the blood passes through

the lungs, the greater part travelling through a channel, the Ductus Arteriosus, which communicates with the aortic arch. The aorta divides into the common iliacs which further divide into the internal and external iliacs; and from the internal iliacs the hypogastric arteries leave, ascending alongside of the bladder to the umbilicus and thence winding spirally around the umbilical vein as the umbilical arteries in the cord, they reach the placenta. Here they split up into arterioles and capillaries in the villi. The foetal blood contained in the placenta is thus constantly undergoing changes that in the adult occur in the lungs, the liver, the blood-forming and other organs.

CHANGES AFTER BIRTH

After the birth of the child, when the first inspiration is taken, all the mechanical conditions of the circulation are modified. The resistance to the blood flow through the lungs is diminished, and the blood passes from the pulmonary arteries through the lungs into the left auricle. The pressure in the left auricle is raised, while in the right auricle it falls, so that the foramen ovale is closed and ~~lets~~ ^{lets} so. The increased rush of blood from the right ventricle through the pulmonary artery, consequent upon the suction action of the circulatory system in the lungs, makes it impossible for any blood to go through the ductus arteriosus, which therefore collapses, becomes obliterated and shrinks up. Consequent on the ligature applied on the umbilical cord, the supply of the blood from the vein is cut off, the walls of the umbilical vein agglutinate, and the vein is obliterated, remaining as a cord-like ligament passing to the liver—the ligamentum teres. The ductus venosus also collapses and shrinks and becomes a vestigial structure. The hypogastric arteries contract and thrombose and form the obliterated hypogastrics of the adult. Hence the changes that take place in the circulatory system of the infant after birth are:—

- (1) Obliteration of the umbilical vein.
- (2) Obliteration of the ductus venosus.
- (3) Obliteration of the ductus arteriosus.
- (4) Closure of the foramen ovale.
- (5) Obliteration of the hypogastric arteries.

SECTION II

PHYSIOLOGY OF PREGNANCY

CHAPTER V

MATERNAL CHANGES DUE TO PREGNANCY

DURING pregnancy many demands are made on the maternal organism consequent upon the rapid growth of the fertilised ovum. The fertilised ovum requires increasing space for its proper development and an adequate blood supply for its nourishment. In consequence, there is a demand on various organs associated with the general metabolism for increased activity. To meet these requirements of the growing foetus, the maternal system has to undergo certain changes and these will be referred to here.

The Uterus. The most marked changes are naturally noted in the uterus. In a nulliparous woman the uterus is a pear-shaped organ about 3 ins. long and is situated within the pelvis. At term the uterus is found to have filled up the greater part of the abdominal cavity and to have undergone considerable hypertrophy. The enlargement of the uterus is due chiefly to the hypertrophy of the existing muscle fibres and to the formation of new ones. The muscle fibres of the cervix also undergo hypertrophy, but not to the same extent as those of the uterine body. The uterine connective tissue is increased and becomes softer. In the first few weeks of pregnancy the body of the uterus assumes a globular form and later becomes almost spherical. Then it becomes rapidly increased in length more than in breadth, and finally assumes an oval form at the end of pregnancy. The uterus grows out of the pelvis by about the fourteenth week.

To keep pace with the growth of the uterus as well as the growing ovum, the blood supply of the uterus must be very liberal. The arteries hypertrophy, the veins are also increased in size, the lymphatics of the uterus enlarge and multiply during pregnancy, so that the full term uterus is richly supplied with blood and lymph.

The growth of the uterus is usually proportionate to the period of pregnancy, but under certain conditions it may be either much larger than the period of pregnancy would warrant, or even smaller. A few weeks before term there is a falling forward of the uterus, which gives rise to a feeling of relief to the mother.

the lateral tube on either side is generally stretched out in the artery and is much more vascular. The uterine end of the division is usually closed, but the fimbriated extremity remains inter-

hyperplastic. The round ligaments are thickened and hypertrophied. The thes are enlarged, especially the one containing the corpus cum-

The vagina is increased in vascularity, which is one of the marked changes during pregnancy, and consequent upon this is a more copious secretion and the characteristic violet discoloration of pregnancy. The increased vascularity at the time



FIG. 13.—Bluish discoloration of the vagina.

of pregnancy is not confined to the genitalia, but extends to other organs in the vicinity. In consequence, there is a slight relaxation of the various pelvic joints which gives rise to an increase in their mobility.

The abdominal wall distends as the pregnancy advances and grows thinner, especially around the umbilicus. The skin over the abdomen shows depressed lines, pinkish or slightly bluish in appearance. These lines are called *striae gravidarum*. They are curved, irregular, arranged more or less concentrically, sometimes radially around the umbilicus, gradually becoming broader and deeper near Poupart's ligament. They may also be found over the thighs on the anterior aspect, sometimes on the posterior aspect

MATERNAL CHANGES



FIG. 14.—Striae gravidarum.



FIG. 15.—Breast changes in pregnancy.

as far as the knees, as well as under the breasts. These lines are caused by the rupture of the subcuticular elastic fibres, and after delivery they heal up, leaving pearly white or silvery bright lines, now known as *linea albicantes*.

The Breasts. Marked changes take place in the breasts consequent upon pregnancy, and such changes are more obvious in primigravidae than in multigravidae. The changes occur particularly at two different periods of pregnancy—about the second month and at the fifth month. During the second month the breasts increase in size and sensitiveness and a bluish discoloration appears in the form of streaks, especially at the periphery. The nipple becomes more erectile and, with the areola, more deeply pigmented. Prominent tubercles, Montgomery's follicles, are seen in the primary areola. Later, about the fifth month, a less deeply pigmented area forms around the primary areola, which is known as the secondary areola, and on this also some tubercles, secondary Montgomery's follicles, may appear. After the first few months a little clear, sticky fluid may be expressed from the nipples, which later becomes yellowish in colour. This is known as the colostrum.

CHANGES IN OTHER SYSTEMS

Side by side with these local changes, changes are noticed consequent on pregnancy in the other systems.

Circulatory System. The heart has undoubtedly more work to do during pregnancy because of the increase in the volume of the blood and the necessity to maintain the flow of the blood stream through the enlarged uterus and the placenta. Whether this increased output necessarily leads to a hypertrophy of the heart is a matter of some doubt. It is possible that the reserve power of the heart is able to cope with the increased needs during pregnancy, as the strain on the heart is not sudden, but very gradual.

The Vascular System. The total volume of blood is probably increased during pregnancy, and there appears to be reason to believe that there is a definite hydremia. This results in a slight decrease in the hæmoglobin and the cellular content, but there is no true anæmia. The border-line, however, between the physiological and the pathological is so indefinite that not infrequently anæmic conditions of pregnancy are noted. These will be more fully dealt with in the chapter on diseases complicating pregnancy (Anæmias).

The blood-pressure normally varies between 110 mm. Hg and 120 mm. systolic, and 75 to 85 mm. diastolic. Variations in blood-pressure are of extreme significance during pregnancy, and any rise up to or above 140 mm. systolic or 90 mm. diastolic, should

always caution the obstetrician to investigate the possibilities of toxæmia. A low blood-pressure is also of serious significance, particularly if the patient goes into labour.

Another change that may be noted in the circulatory system during pregnancy is an increased tendency to varicosity of veins, particularly in the lower extremities and about the genitalia. Associated with this varicosity a certain degree of œdema may appear. (Edema in pregnancy should be thoroughly investigated, as it may be due to more serious causes.

The Respiratory System. As the uterus increases in size and presses on the diaphragm, the lungs are naturally displaced. The diaphragm is pushed up, the respiration becomes more costal than abdominal, and in some cases it may be deeper and more frequent.

Certain changes in the nose and throat are said to be characteristic. The turbinated bones are turgid and thickened and may sometimes close the nares. The larynx is somewhat congested and the voice may be affected.

Digestive System. During the early weeks of pregnancy, in the first trimester, minor disorders of digestion are not infrequent. Nausea and vomiting, spoken of generally as morning sickness, start about the sixth week and usually continue to the twelfth week. In some cases they may start much earlier, even during the second week, and persist for a much longer time. Vomiting may be so exaggerated as to be termed *Hyperemesis gravidarum*. Occasionally it may occur even in the later weeks of pregnancy. It is more prominent in primiparæ. There is increased salivation and a tendency to constipation.

The liver is the seat of marked changes during pregnancy. The whole organ is enlarged and hyperæmic. There appears to be a definite decrease, if somewhat slight, in the functional capacity of the liver. The stomach is displaced in the later months of gestation, being forced upwards, backwards and to the left. The intestines are also affected; hæmorrhoids are common, partly due to the constipation and partly to the increased venous pressure below the diaphragm.

Urinary System. The kidneys are subject to a considerably increased strain during pregnancy. The urine is usually increased in quantity, the specific gravity is low, and in some cases albumin may appear, particularly in the later weeks. Sugar may also be occasionally found in the urine during gestation, and may be due to the absorption of the milk sugar from the functioning breasts. Hypertrophy and atony of the ureters may occur. The ureters may sometimes be compressed by the growing uterus, and under such conditions a mild infection develops which may eventually result in a pyelitis.

In the early months the bladder is compressed by the growing uterus, giving rise to increased frequency of micturition, which is one of the symptoms noted at this period.

The Skeleton, Skin and Teeth. During pregnancy the bones show increased vascularity. The various pelvic joints become more mobile and sometimes they may become so relaxed that locomotion is not comfortable. The skin is much affected and pigment is deposited in certain definite areas—the nipples, the vulva, the linea alba, the navel and the face. In some women the pigmentation is much more marked than in others. The teeth are prone to decay, and this is perhaps due to a deficiency in the calcium content resulting from the increased demand for it by the growing fœtus.

Nervous System. The nervous system is in a more excitable condition in the pregnant woman. Temperamental changes are not infrequent. Melancholia and real psychosis may develop, especially in those with a familial tendency.

The Endocrine System. Perhaps the most remarkable changes in pregnancy occur in the endocrine system. Their full significance is not yet clearly understood, but recent literature would make it appear that these glands play a dominant part in the physiology of pregnancy, and they will be described in detail in the chapter on "Endocrinology in Obstetrics," in the Appendices.

CHAPTER VI

THE SIGNS, SYMPTOMS AND DIAGNOSIS OF PREGNANCY

ALTHOUGH in the majority of cases the diagnosis of pregnancy is fairly simple, sometimes in those very cases where a certain diagnosis is of the utmost importance, difficulties may be encountered which make it impossible to arrive at a definite conclusion. A number of signs and symptoms taken together generally help in arriving at a positive diagnosis of pregnancy; and in the latter part of pregnancy, single signs may render the diagnosis probable or even positive. It is, however, judicious to be reserved in the expression of one's opinion, if there is any doubt as to the condition.

An expression of opinion may involve serious consequences, legal and social. Unfortunately, to the lay mind, it seems inexcusable for errors in diagnosis to occur. Mistakes can only be avoided by observing the greatest care in each detail of the examination and by a thorough consideration of all the signs and

symptoms present. Not much emphasis, however, can be laid on the patients's statements, as in some cases at any rate the patient may, consciously or unconsciously, mislead the physician into an erroneous position. The physical signs are of far greater importance than the symptoms, and are obtained by sight, touch and hearing; that is, by inspection, palpation, percussion and auscultation, together with such other methods of examinations as are detailed later.

The signs and symptoms of pregnancy vary with the different periods of pregnancy, and we shall classify them under three periods or trimesters, namely, the first, second and third trimesters of pregnancy.

FIRST TRIMESTER

(First twelve weeks of pregnancy.)

Subjective Symptoms. These are :—

- (1) Amenorrhœa.
- (2) Morning sickness.
- (3) Salivation, changes in disposition.
- (4) Irritability of the bladder.

Amenorrhœa. As a general rule this is the first warning of pregnancy to women who have been exposed to impregnation. It is, however, not a reliable symptom, because there are several conditions where amenorrhœa may occur without conception, and in some cases it is not present even when pregnancy has occurred. However, when occurring in healthy women who have menstruated regularly previously, it is strongly presumptive of pregnancy. Chronic diseases, such as tuberculosis, anæmia, syphilis, acute affections such as pneumonia and dysentery, may cause a cessation of the menstrual flow, either permanently or temporarily. Change of climate, exposure to cold, mental emotions, general debility, excessive desire to become pregnant or a fear of pregnancy, may also be instrumental in bringing about a cessation of the menses. Pregnancy may occur in women in whom the menstrual flow does not appear, as in women during lactation; again, menstruation may continue during pregnancy for two reasons. In the early weeks of pregnancy it is possible that menstruation may occur once or twice before the fusion of the decidual membranes, or in those rare cases of malformations of the uterus like uterus didelphys, where menstrual discharge may occur from one half of the uterus, while the other half is the seat of pregnancy. Again, hæmorrhages of a pathological character may occur during pregnancy, due to diseases of the genital tract. It is thus seen that

while amenorrhœa is ordinarily a valuable symptom, it cannot alone help us to a definite diagnosis of pregnancy.

Morning Sickness. Nausea and vomiting are usually associated with pregnancy in the early weeks. Morning sickness generally begins about the fourth to sixth week of pregnancy and may continue till about the sixteenth week. Usually it is present in the early hours of the morning and shows signs of abatement as the day progresses. In some cases, however, sickness may continue throughout the day. Sometimes nausea is more persistent than vomiting; occasionally we have seen cases of nocturnal vomiting, the patient feeling comfortable till evening when she begins to have a feeling of nausea, and vomiting occurs during the night. In some cases there may be no morning sickness.

So long as it does not affect the general health, morning sickness is a physiological phenomenon associated with pregnancy. Occasionally it may become a pathological symptom, when the nausea and vomiting may become so excessive as to prevent the possibility of any nourishment being retained or even taken by the patient. This is called—*hyperemesis gravidarum*. Vomiting may, however, be due to other causes referable to the gastro-intestinal tract, or to certain diseased conditions of the pelvic organs.

Salivation and Changes in Disposition. Salivation is an early symptom and is pronounced in certain cases. The changes in disposition may be shown by a change in the temperament, resulting in the patient becoming irritable and capricious. She may evince a desire for articles of food quite at variance with her ordinary habits. These have been termed the longings or *pica* of pregnancy; they are not of diagnostic value, as they are purely subjective and may occur in various other neurotic conditions.

Irritability of the Bladder. Frequency of micturition is sometimes complained of, and is due to the pressure exerted on the bladder by the growing uterus. As the uterus increases in size and becomes an abdominal organ, this pressure is relieved and the symptom gradually disappears.

Objective Signs. These are:—

- (1) Changes in the breast.
- (2) Bluish discoloration of the vulva and vagina.
- (3) Softening of the cervix and vagina.
- (4) Changes in the shape, size, position and consistency of the uterus.
- (5) Hegar's sign.

Changes in the Breast. Changes in the breast are marked particularly in *primigravidae*. There is a general enlargement of the organ, with prominence of the veins and pigmentation forming the characteristic primary and secondary areolæ. The nipples also

become more prominent, erectile and turgescient; Montgomery's follicles appear first on the primary areolæ and later on the secondary areolæ. The secondary areola develops from the fifth month onwards, while the other changes generally take place during the first trimester—from the fourth to the twelfth week of pregnancy. The presence of a little fluid in the breast can usually be detected from the twelfth week onward by gently squeezing the breast in the direction of the nipple. The fluid is clear and contains some colostrum corpuscles.

While breast changes are constant in pregnancy, they may also be brought about by certain other pathological conditions of the uterus and ovary. In multiparæ the changes in the breasts are not of much diagnostic value, because pregnancy may take place in a lactating woman, while pigmentation of the areola and milky secretion in the breasts may persist after a previous pregnancy. While the absence of these signs does not prove the non-existence of pregnancy, their presence cannot help us to a positive conclusion unless supplemented by other signs.

Bluish Discoloration of Vagina. This sign is generally detected between the fourth and eighth week of pregnancy, and it increases in intensity up to the sixteenth week, when it has perhaps reached its maximum. It persists throughout pregnancy. The vulval and vaginal mucous membranes, consequent upon the congestion of the blood vessels, present a violet or light blue tint, and later a purplish or deep blue tint. This sign was first described by Jacquemier, and later emphasised by Chadwick, and is therefore known as *Jacquemier's sign* or *Chadwick's sign*.

Besides this discoloration there may be a sensation of increased warmth in the genitalia resulting from the augmented blood supply to those parts. At a later stage increased vaginal pulsations may be noticed, and this sign is sometimes spoken of as *Osiander's sign*. This may, however, be produced in non-pregnant conditions, such as fibroids and pelvic inflammations, and cannot therefore be depended on for a diagnosis.

Uterine Changes. The uterus is perhaps the most important organ to undergo remarkable changes due to pregnancy. In the early weeks of pregnancy changes in volume, shape and position occur. These can be made out by bimanual examination, either by the abdomino-vaginal method or in some rare cases where such vaginal examination is impossible by the abdomino-rectal method of palpation.

The virgin uterus is pyriform or pear-shaped, and flattened from before backwards. During the first eight to ten weeks of gestation the organ loses its flattened pear shape and gradually becomes

rounded or globular. On account of its increased weight the uterus in the early weeks of pregnancy sinks down into the pelvic cavity.

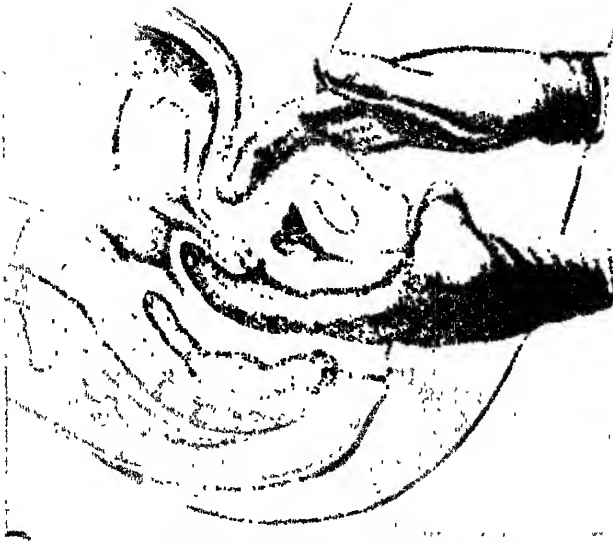


FIG. 16.—Method of eliciting Hegar's sign.

After the twelfth week it rises gradually upwards towards the abdomen.

Alterations take place in the consistency of the organ and it becomes much softer. The softening is particularly noticeable in the cervix and the lower uterine segment. This softening of the cervix is an important sign and can be recognised from the fourth week onwards. At first confined to the cervical mucous membrane, it gradually involves the deeper tissues till the whole cervix becomes softened. The comparison has been made that the cervix, in the non-gravid condition, is as hard as the tip of one's nose, and that in pregnancy it becomes as soft as one's lips or the lobe of the ear.

Softening and compressibility of the isthmus or lower uterine segment constitute what is known as *Hegar's sign*. This is of great value and has been observed from about the sixth or eighth week to the twelfth week of pregnancy. This sign is more difficult to recognise in multiparæ than in primiparæ, but when definitely present constitutes one of the most valuable of physical signs in the recognition of pregnancy at this period.

Hegar's sign can be elicited in several ways:—

- (1) In women with a lax abdominal wall and a roomy vagina, two fingers are introduced into the vagina and passed posteriorly

behind the cervix, while the fingers of the other hand are pressed down into the abdomen from above the symphysis pubis. The fingers of the two hands will almost meet as if there was no resisting tissue in between and the cervix and body of the uterus will appear as two independent masses.

(2) In cases where the abdominal wall is not lax, the index finger may be passed into the rectum, while the thumb is inserted in the vagina in front of the cervix into the anterior fornix. The soft, almost papyraceous, consistency of the lower uterine segment can be felt between the finger and the thumb.

(3) In some cases two fingers may be passed behind the cervix into the posterior fornix and the thumb in front of the cervix into the anterior fornix. With the other hand the fundus is pressed towards the symphysis pubis, so that the uterus is in an anteflexed position. In this way the soft lower uterine segment can be recognised between the two fingers and thumb.

SECOND AND THIRD TRIMESTERS OF PREGNANCY

Subjective Symptoms. During this period certain of the signs and symptoms that were present in the earlier periods of pregnancy gradually disappear and other signs and symptoms become apparent. Morning sickness, increased salivation and frequency of micturition generally disappear by this time. An important symptom that may be felt during the second trimester is *quickening*. The active foetal movements are generally first felt by the mother at the end of the sixteenth week, and the term *quickening* applied to this first recognition, arose out of the erroneous impression that only when the mother became conscious of the spontaneous movements of the foetus was life imparted to the foetus. This movement of quickening has been compared to the fluttering of a bird imprisoned in the hand. The movements become more vigorous, and may sometimes be painful and disgusting for the patient. They increase after fasting and may cease entirely in some cases although the foetus continues to be alive. Their sudden and complete cessation, however, is suggestive of death of the foetus *in utero*. Foetal movements may be mistaken for many other conditions such as muscular contractions of the abdominal muscles, and peristaltic movements of the intestines.

The date of "quickening," if definitely ascertainable from the patient, is important for purposes of reckoning the period of pregnancy and calculating the probable date of delivery.

Objective Signs. The objective signs of this period of pregnancy are of extreme importance, as they furnish a definite

and reliable guide to the positive diagnosis of pregnancy. These signs are, in the second trimester:—

- (1) Changes in the skin.
- (2) Changes in the size of the uterus
- (3) Intermittent uterine contractions.
- (4) Active foetal movements.
- (5) Palpation of the foetal parts.
- (6) Auscultatory signs.
- (7) Passive foetal movements.

Changes in the Skin. Pigmentation is one of the characteristic changes that take place in pregnancy. This is more marked in the forehead and cheeks in the form of dark brown patches noticed more particularly in brunettes. Pigmentation and striæ may also be seen on the breasts and over the abdominal wall. A linear pigmented area stretching from the umbilicus to the symphysis pubis is of deeper colour and is known as the *linea nigra*. On either side over the abdominal wall are other striæ, whitish in appearance and spoken of as *linea albicantes*.

Changes in the Shape and Size of the Uterus. The uterus being a progressively growing organ in pregnancy, gradually increases in size, becomes ovoid in shape, and can be felt at different levels in the abdomen in successive periods of pregnancy.

Intermittent Uterine Contractions. This is known as Braxton-Hick's sign, and it is found irrespective of whether the fetus is alive or dead. It may be detected by palpation as early as the sixteenth week. These contractions as a rule occur every five or ten minutes and last for a few seconds. They may be easily elicited by keeping the hand in full contact with the abdominal wall over the uterus, when the gradual relaxation and contraction of the uterine musculature will be felt.

Active foetal movements when felt, seen or heard afford positive evidence of pregnancy and of a live child. They may be noticed after the sixteenth or eighteenth week of pregnancy, but more generally during the last trimester.

Palpation of the Foetal Parts. About the middle of pregnancy the fetus is generally increased to a size when it can be recognised by abdominal palpation. As pregnancy progresses this sign is of great value, not only in detecting pregnancy but also in ascertaining the various positions of the fetus in utero.

Auscultatory Signs. Auscultation over the abdominal wall during pregnancy is useful to elicit various sounds, some of which are of great importance in the positive diagnosis of pregnancy.

(a) *The Foetal Heart.* The foetal heart can be heard about the sixteenth week of pregnancy and resembles the ticking of a watch heard through a pillow. This is the only sign of pregnancy which

by itself and in the absence of all others is perfectly reliable for the diagnosis of pregnancy. The point of greatest intensity of the foetal heart sounds will vary with the position of the child *in utero*. Ordinarily the foetal heart beats 130 to 150 times a minute.

(b) *The Funic Souffle*. This is a soft murmur synchronous with the foetal heart-beat, heard rarely, and said to be an unfavourable sign, indicative of foetal distress, if persistent. It is due to obstruction to the rush of blood through the umbilical arteries caused by compression of the umbilical cord through knots, twists or pressure by extrinsic factors.

(c) *The Uterine Souffle*. This is easily detected from about the sixteenth week, and is a soft blowing or musical murmur, synchronous with the maternal heart-beat. It may be heard, however, in conditions of uterine enlargement from causes other than pregnancy. It is due to the passage of blood through the dilated uterine vessels.

Other sounds that may be heard are due to the movements of the foetus, intestinal movements, and contractions of the abdominal muscles themselves.

Passive Foetal Movements. These may be elicited by internal or external manipulations, producing a passive movement of the foetus *in utero*.

(a) *Internal Ballottement*. This sign may be obtained from the sixteenth week till about the twenty-eighth week of pregnancy. To elicit this sign the patient is placed in the dorsal posture, the index and middle fingers are introduced into the vagina and steadied against the lower pole of the foetus, which is pressed down by the other hand over the abdomen. The fingers in the vagina give a sharp tap upwards. The impulse thus generated is transmitted to the foetus which bounds upward and then after a moment falls back upon the examining fingers. If clearly elicited it must be considered as one of the most valuable signs of pregnancy at this period. Rarely, some pathological conditions may give rise to a very similar sensation; for example, a calculus in the bladder, a fibroid or ovarian tumour complicated with ascites; but in such cases no other sign of pregnancy will be present. Before the sixteenth week the foetus is too small to respond to the digital impulse, and after the twenty-eighth week the foetus is relatively too large, filling so much of the uterine cavity that it cannot be moved about as freely as formerly. This sign may not be elicited in conditions associated with a deficiency of the liquor amnii or where the foetus is not presenting by the cephalic pole.

(b) *External Ballottement*. This sign is elicited with the patient in a recumbent position, by steadying the uterus with one hand applied to the side and gently tapping with the other hand

from the opposite side, when the impact of the foetal parts will be felt. It depends upon the amount of liquor amni present in the uterine cavity. It may sometimes be elicited in cases of fibroids or ovarian tumours associated with ascites. It is difficult to elicit in cases where the abdominal wall is thick and fatty and in conditions where the liquor amni is very much diminished in quantity.

THIRD TRIMESTER

During this period of pregnancy the painless uterine contractions persist, the foetal movements are more easily felt and seen, ballottement is generally not obtainable, foetal parts are easily palpable, while the foetal heart is well heard if the foetus is alive and the uterine souffle definitely made out. The uterus progressively enlarges till at term it fills almost the whole of the abdomen.

Summary of the Diagnostic Signs of Pregnancy. The signs of pregnancy may be divided into three classes:—

- (1) Certain, or positive signs;
- (2) Probable signs; and
- (3) Doubtful signs.

(1) The *positive or certain signs* are:—

- (i) Palpation of foetal parts.
- (ii) Auscultation of the foetal heart sounds.
- (iii) Foetal movements, active or passive.
- (iv) The funic souffle or umbilical murmur, if present.
- (v) The skeleton of the foetus when seen in a skigram.

(2) The *probable signs* are:—

- (i) The progressive enlargement of the uterus and its characteristic alterations in shape
- (ii) The compressibility of the lower uterine segment—Hegar's sign.
- (iii) Intermittent uterine contractions—Braxton-Hick's sign.
- (iv) Changes in the consistency of the enlarging uterus.
- (v) Changes in consistency and colour of the vagina and cervix.
- (vi) Uterine souffle.
- (vii) Cessation of menstruation.
- (viii) Mammary signs—enlargement of the breast, and Montgomery's tubercles.
- (ix) Pigmentation of the skin.

(3) The *uncertain or doubtful signs* are:—

- (i) Changes in the size and shape of the abdomen.
- (ii) Reflex phenomena, such as nausea, vomiting.

- (iii) Pressure signs, such as irritability of the bladder or rectum.
- (iv) Cutaneous signs, such as chloasma on the forehead and cheeks and dark circles under the eyes.

The signs and symptoms of pregnancy may now be classified according to the time at which they appear:—

First 4 Weeks. There is cessation of menstruation, associated with softening of the cervix.

4 to 8 Weeks. Hegar's sign may now be obtained; pulsations in the vaginal fornices, nausea and vomiting, frequency of micturition, and mammary changes may be noted. Definite enlargement of the uterus may also be noted.

8 to 12 Weeks. The softening of the cervix increases; gastric and mammary changes continue; Hegar's sign may be elicited; the uterus has changed in shape, size and consistency and can be definitely felt as a globular organ, of the size of a foetal head.

12 to 16 Weeks. The uterus begins to rise into the abdominal cavity; the abdomen becomes enlarged; the breast changes increase and, as a rule, the gastric disturbances cease. At the end of this period the foetal heart sounds may occasionally be heard. The uterine souffle is present; the patient sometimes feels quickening and the examiner may detect foetal movements as well as uterine contractions. Internal ballottement may also be obtained.

16 to 20 Weeks. The abdominal enlargement is much more obvious and "quickening" definitely felt. The mammary changes continue with the appearance of the secondary areolæ; ballottement readily reveals the presence of the foetus and foetal heart sounds are audible.

20 to 24 Weeks. The foetal heart sounds and movements are all evident. The fundus of the uterus is at the level of the umbilicus; cutaneous striæ develop.

24 to 28 Weeks. The fundus is now three fingers' breadth above the umbilicus; ballottement is still obtainable; cutaneous striæ continue to develop.

28 to 32 Weeks. Ballottement is hardly obtainable. The fundus is now half way between the umbilicus and the ensiform cartilage. The abdomen is much enlarged and is pear-shaped. Foetal parts are now easily palpable.

32 to 36 Weeks. Ballottement is no longer obtainable, although the other physical signs are all more marked. The fundus at the end of this period is almost at the level of the ensiform cartilage.

36 to 40 Weeks. The physical signs are distinct. At the middle of this period the fundus is at its greatest height; it then sags forwards and settles down in the last two weeks, thereby lessening the pressure symptoms and the patient feels lighter and more comfortable. The vertex is usually engaged in the pelvis in primigravidae.

Aschheim-Zondek Test and Radiological Diagnosis

The difficulty that sometimes arises in making a definite diagnosis of pregnancy, before any of the positive signs manifest themselves, has induced several workers to devise laboratory tests for this purpose. One of the earliest to experiment along these lines was Abderhalden, who in 1912 described a method for ascertaining the existence of pregnancy by means of certain changes occurring in the blood-serum of the woman. Other workers followed along these lines to determine the presence of some specific ferment in the maternal blood which possessed the power of neutralising the fetal elements that are constantly gaining access into the maternal blood stream.

Aschheim-Zondek Test. The most important of all pregnancy tests is the Aschheim-Zondek test. Aschheim and Zondek demonstrated in 1928 that the urine of pregnant women contained a hormone which had definite properties. It has been proved that this hormone is similar to the gonadotropic hormone of the anterior pituitary gland, and that it is secreted in fairly large quantities in the urine of pregnant women from an early stage of pregnancy.

The test is performed as follows. Immature female mice, twenty-five to thirty days old, are used for this test. About 25 to 30 c.c. of fresh filtered morning urine of the woman is taken and shaken up with 90 to 120 c.c. of ether for three to five minutes, and the ether is then separated off. To the residual urine 0.9 gm. of glucose is added. The urine is injected into five mice in varying doses, from 0.2 to 0.4 c.c. for two days, thrice daily. The injections are given as follows:—

Mouse 1	6 × 0.2 c.c. of urine
" 2	6 × 0.25 "
" 3	6 × 0.3 "
" 4	6 × 0.35 "
" 5	6 × 0.4 "
" 6	Control—no injections

A positive reaction may always be expected within seventy-two hours. The abdomen of the mouse is opened and the ovaries examined. The following changes may be noted when the reaction is positive: the ovaries are enlarged and hyperæmic and on their surface may be seen small hæmorrhagic areas. The appearance is

very characteristic, as there is marked tendency towards luteinisation, which may be noted by the presence of numerous corpora lutea.

The Aschheim-Zondek test has got certain drawbacks:—

- (1) It is not always possible to have a litter of mice of the approximate age to perform this test.
- (2) Repeated injections are necessary and sometimes the mice do not stand these injections and die before the reaction is complete.
- (3) The delay of seventy-two to a hundred hours may, in some cases, be undesirable.

For these reasons various modifications have been tried, the most prominent of which is known as Friedman's test.

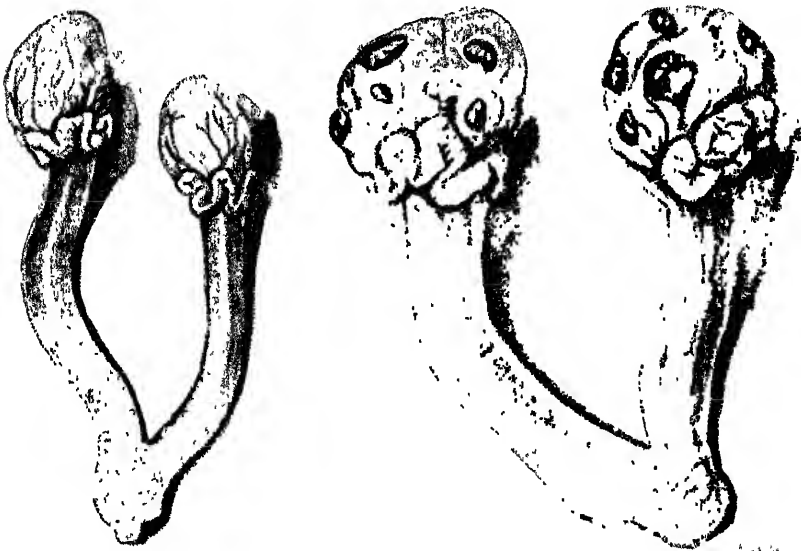


FIG. 17.—Friedman's test showing the ovaries before and after the test.

Friedman's Test. This test is carried out by injecting the urine intravenously into rabbits, and has the advantage that the technique is simpler and the results can be noted at an earlier stage—thirty-six to forty-eight hours.

The test is done as follows. Female rabbits, aged twelve to twenty weeks, which have been isolated for a period of three weeks are used. Two injections of 6 c.c. of urine are given intravenously into the marginal vein of the ear daily for two days, and forty-eight hours after the first injection the peritoneal cavity is opened and the ovaries inspected *in situ*. The changes noted in the ovaries are characteristic: ovulation is easily recognised; either fresh

corpora lutea or projecting corpora hemorrhagica can be seen on the surface. Before the test is undertaken, it is essential to be certain that ovulation has not taken place recently and that the rabbits are not pregnant. It is to ensure this that the rabbits should be kept isolated for twenty days.

The Frog Test. In this test pregnancy urine is injected into the female *Xenopus laevis* (South African clawed toad). This results in inducing ovulation and extrusion of hundreds of ova in 18 hours.

The Friedman's test is accurate in 98 per cent. of cases.

The Aschheim-Zondek test is one of the most reliable of pregnancy tests and has given a 97 to 100 per cent. accuracy with different observers. The test is of value both from the qualitative as well as the quantitative points of view. It has been ascertained that positive results can be obtained in pregnancy of two to three weeks' duration. The question of the exact time after normal parturition, when the pregnancy test becomes negative, has been indefinite, different observers giving varying periods. An exhaustive investigation carried out by Crewe at the Pregnancy Diagnosis Station at Edinburgh has furnished some reliable data. It appears from his results that the test invariably yields a negative result ninety-six hours after normal and complete parturition, and he suggests that an Aschheim-Zondek test undertaken on the fifth day after delivery might well be used as a reliable procedure for the diagnosis of retained living products of conception.

From the quantitative point of view the test has been utilised to diagnose the presence of hydatidiform mole and chorion epithelioma. In hydatidiform mole, the chorionic villi take on extra activity, and it would appear that much larger quantities of the anterior pituitary-like hormone are secreted in the urine; so that it has been possible to obtain a positive Aschheim-Zondek reaction even after very high dilutions. The certainty of the diagnosis of hydatidiform mole and chorion epithelioma is increased when a positive sign is manifest even with high dilutions.

In the other condition, which generally results after hydatidiform mole but may also occur after abortion or normal pregnancy, viz., chorion epithelioma, the Aschheim-Zondek test is of great importance. When a positive reaction is obtained some weeks after delivery or abortion, the possibility of a chorion epithelioma should always be borne in mind. The factor responsible for a positive reaction in such cases is the presence of live chorionic villi attached to the uterine wall.

The Hofman modification of the Friedman test which uses blood serum is an improvement because a quicker result may be obtained and because of the availability of a sufficient amount of

hormone in the blood at any time of day. This test performed with the spinal fluid is of great value where hydatidiform mole and chorion-epithelioma are suspected particularly for early detection of chorion epithelioma and for recognition of metastasis before clinical signs and symptoms appear.

RADIOLOGICAL DIAGNOSIS OF PREGNANCY

Another method of diagnosing pregnancy is by the use of Roentgen rays. An X-ray picture is of great value in diagnosing pregnancy and also in giving certain details about the pregnancy.

The diagnosis of pregnancy by means of the radiogram has been in vogue for several years; but as a radiogram of the foetus is not generally positive before the sixteenth week of pregnancy it is obvious that this method will not be of help in the early weeks. Since the Aschheim-Zondek test and Friedman's test have come into use and are so accurate even in the early stages, the use of the radiograph for purposes of diagnosis has receded into the background.

CHAPTER VII

DIFFERENTIAL DIAGNOSIS OF PREGNANCY

PREGNANCY may have to be differentiated from other conditions which produce an enlargement of the uterus. Among conditions which may lead to an error in diagnosis in the *early months of pregnancy* may be mentioned:—

- (1) Subinvolution of the uterus and chronic metritis.
- (2) Hæmatometra.
- (3) Interstitial or submucous fibroids.

Subinvolution of the uterus and chronic metritis may result in a slight increase in the size of the uterus, but some of the characteristic signs and symptoms of early pregnancy are not noted. Thus, Hegar's sign is not present; the uterus is not of the characteristic, globular shape, and there may be pain in the back or over the hypogastrium, with tenderness of the uterus. In subinvolution there is often a history of abnormal menstruation together with a bloody muco-purulent discharge.

Hæmatometra is a condition caused by the retention of menstrual fluid in the body of the uterus as a result of closure of some portion of the cervical canal, either at the internal os or the external os or in the cervical canal itself. The accumulation of the fluid causes a uniform enlargement of the uterus and the

tumour increases in size periodically, accompanied by pain and tenderness. It is associated with amenorrhœa, but a careful examination will detect the obstruction and the nature of the uterine enlargement, which is soft and fluctuant or possibly tense. These findings, together with the history of the case, will reveal the diagnosis.

Fibroid tumours of the uterus, particularly interstitial fibroids, may occasionally give rise to a uniform enlargement of the uterus, and in some cases, owing to changes in the ovaries, they may be associated with amenorrhœa. The absence of Hegar's sign and the early symptoms of pregnancy, such as salivation, morning sickness, etc., together with the comparatively harder feel of the uterus may serve to put one on guard in considering the diagnosis. It must, however, be stated that occasionally a gravid uterus has been mistaken for a fibroid, and a laparotomy has not been infrequent. Even after opening the abdomen the uniformly enlarged condition of the uterus, together with the peculiar colour, has given room to doubt whether the condition was one of pregnancy or fibroid. A simple test will help to settle the diagnosis. The needle of a hypodermic syringe is passed into the enlarged uterus, and in cases of fibroids the needle will enter with some degree of resistance; while if the condition is a pregnancy, the needle will slip in more easily and clear fluid (liquor amnii) can be withdrawn. This is a certain way of differentiating between fibroids and pregnancy, and is valuable in those cases where pregnancy is also complicated by fibroids.

A valuable aid in the differential diagnosis of this condition is the Zondek-Aschheim test already referred to. If the pregnancy has advanced to nearly sixteen weeks, radiographic examination will be of great help.

In the latter half of pregnancy the condition may have to be diagnosed from ovarian cysts and uterine fibroids. The following points will help to differentiate the three conditions:—

Pregnancy.	Uterine Fibroids.	Ovarian Tumours.
1. Amenorrhœa usually present.	No amenorrhœa; occasionally menorrhagia, if submucous or interstitial fibroid.	No amenorrhœa, unless bilateral.
2. On abdominal palpation: Tumour is somewhat soft and intermittent contractions can be noted together with some degree of fluid thrill.	Tumour hard and irregular; no signs of intermittent contractions generally.	Cystic, so that it does not show any signs of contraction; presence of a fluid depends upon the nature of the contents.
3. Fœtal parts can be felt.	No fœtal parts felt.	No fœtal parts felt.

<i>Pregnancy.</i>	<i>Uterine Fibroids.</i>	<i>Ovarian Tumours.</i>
4. Foetal heart sounds and possibly funic souffle heard.	No foetal heart sounds heard.	No foetal heart sounds heard.
5. Breast changes noted.	No mammary changes.	No characteristic mammary change.
6. Ballottement may be elicited.	No ballottement.	No ballottement.
7. Zondek-Aschheim test positive.	Negative.	Negative.
8. Radiographic examination shows definite evidence of foetal skeleton.	A vague shadow, but no foetal parts.	A vague shadow, but no foetal parts.

Pseudocyesis. This condition may occur in women who have an intense desire to become pregnant. Most frequently it is observed in a woman who is approaching the menopause when her menstrual flow has become scanty or has ceased for a time. A deposit of fat takes place in the anterior abdominal wall and omentum and the intestines become distended with flatus. In such cases several of the doubtful signs and symptoms of pregnancy may be present; for example, menstruation may cease; the mammary signs of gestation may appear and the abdomen may become progressively prominent; the patient may imagine that she feels foetal movements; striae may appear both on the abdomen and breasts. In some cases the condition may go on and eventually spurious labour may set in.

The diagnosis of this condition is not difficult, but the physician should be on guard in assessing any statements the patient may offer in regard to her condition. It will be well for him to submit the patient to an examination under anaesthesia. Care must be taken in these cases to see that an attendant or a relation in whom the patient has confidence is present during this examination, so that later on the woman may not persist in imagining that her pregnancy was terminated.

An X-ray is useful in such cases; needless to say the Zondek-Aschheim test will invariably be negative.

Diagnosis between First and Subsequent Pregnancy. In the large majority of cases it is not difficult to diagnose whether the



FIG. 18.—Pseudocyesis.

patient is pregnant for the first time or has had children previously. In some cases where the woman has had an abortion or a premature delivery, the signs may not be quite characteristic. The following are the points for consideration.

(1) *The Condition of the Mammary.* In a primipara the mammary gland is firmer, fuller and the areola and Montgomery's follicles are more prominent. In a multipara the breasts are more flabby and pendulous, with old white striae and prominent nipples.

(2) *The Abdominal Wall.* This is more relaxed and easily thrown into folds in a multipara and the striae may be much more prominent. Striae may, however occur in other conditions, causing rapid distension of the abdomen, such as ascites, ovarian cysts or adiposity.

(3) *The Vagina.* In virgins the hymen is intact unless there has been any surgical interference sufficient to cause its rupture. In a nulliparous woman the hymen is usually torn, but its remains can be readily made out. In a parous woman, on the other hand, the hymen has almost entirely disappeared and is only represented by warty prominences known as *carunculae myrtiformes*. There are, however, rare cases where an elastic hymen has stretched to such an extent that even after child-birth it is present. Besides the hymen, in a nulliparous woman the fourchette and the perineum are intact. In a parous woman, on the other hand, the fourchette has almost invariably been torn and the perineum may show evidence of previous laceration.

In a nulliparous woman the vaginal mucous membrane is rugose, but in a parous woman the rugæ have disappeared and the vaginal orifice is larger and may be gaping.

(4) *The Cervix.* One of the most important signs of parity is found in the condition of the cervix. In a nulliparous woman the



FIG. 10

A. Cervix in a nulliparous woman.

B. Cervix in a parous woman.

Note the transverse slit and the irregular cicatricies.

external os is circular, the mucous membrane smooth and intact and the orifice closed. In a parous woman, on the other hand, the

orifice is a transverse patulous slit and may admit the tip of the finger. In certain conditions where a premature labour or abortion has occurred, the cervix may not show the characteristic signs; on the other hand, as a result of operative manipulations, the cervix of a nullipara may be torn and resemble a multiparous cervix.

The Duration of Pregnancy and the Probable Date of Confinement. The period of gestation may be ascertained by :—

- (1) The period of amenorrhœa;
- (2) The height of the uterus;
- (3) The measurements of the foetal ovoid in certain cases;
and
- (4) The date of "quickening" if it can be ascertained reliably.

(1) *Amenorrhœa.* The usual period of pregnancy may, for all practical purposes, be taken as ten lunar months, or 280 days, calculated from the first day of the last menstrual period. The

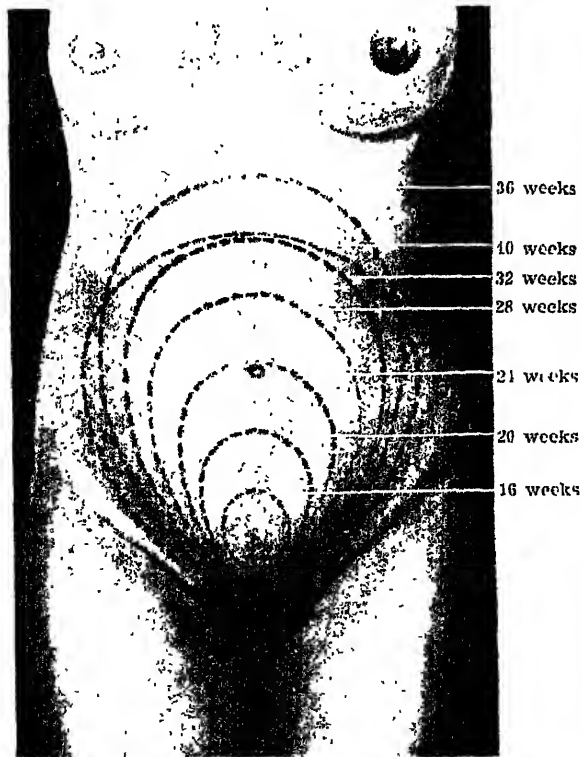


FIG. 20.— Height of uterus at varying periods of pregnancy.

difficulties in regard to this are that occasionally the date of the last period may not be ascertainable, or conception has occurred

during a period of amenorrhœa, following a previous confinement or due to certain diseased condition. In some rare cases the menstrual flow may occur once or twice after the commencement of pregnancy before amenorrhœa is established.

(2) *By the Height of the Uterus.* Under normal conditions the uterus enlarges uniformly and its height is proportionate to the period of pregnancy. It is more or less a pelvic organ up to twelve weeks and from then onwards gradually rises into the abdomen. The height of the uterus according to the period of gestation is as follows:—

16th Week. Just palpable above the symphysis pubis.

20th Week. Midway between the umbilicus and the symphysis pubis.

24th Week. Up to the level of the umbilicus.

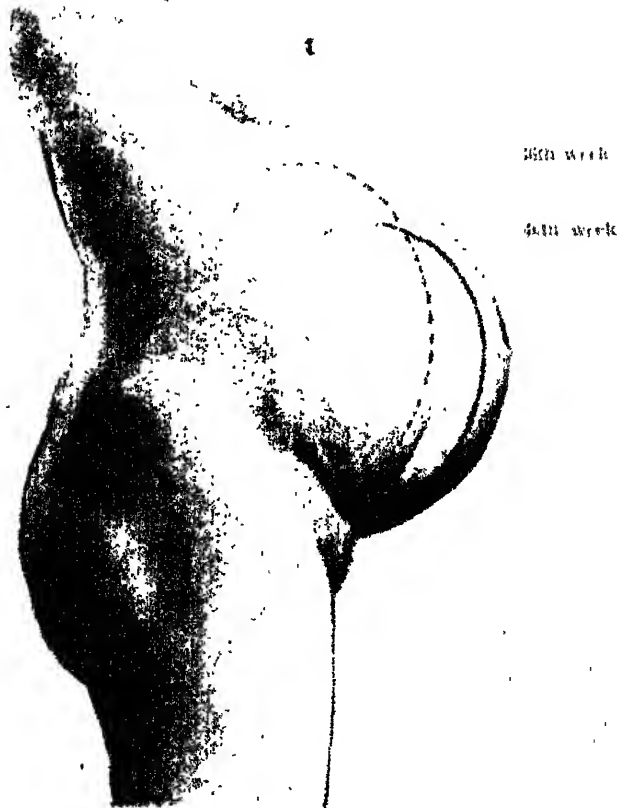


FIG. 21.—The heights of the uterus at the 36th and 40th weeks of pregnancy.

Note the falling forward of the fundus at the 40th week.

28th Week. Three fingers' breadth above the level of the umbilicus.

32nd Week. Midway between the umbilicus and the ensiform cartilage.

36th Week. Almost at the level of the ensiform cartilage.

40th Week. At the level of the uterus at the 32nd week, but there is a falling forward of the fundus.

The calculation of the period of pregnancy from the height of the uterus may, however, be vitiated by certain conditions. The uterus may be much smaller and the height, therefore, much less than the period of amenorrhœa would indicate in the following conditions:—

(i) *In the first half of pregnancy—*

- (a) Extrauterine gestation.
- (b) Death of the ovum resulting in a missed abortion.
- (c) Retroverted gravid uterus.
- (d) Oligo-hydramnios.

The uterus, on the other hand, may be bigger in the following conditions:—

- (a) Hydatidiform mole.
- (b) Hydramnios.
- (c) Tumours of the uterus or of the adnexa in association with pregnancy.

(ii) *In the later weeks of pregnancy—*

The uterus may be smaller than the period of amenorrhœa would warrant in the following conditions:—

- (a) Oligo-hydramnios.
- (b) Premature death of the foetus and consequent arrest of development.
- (c) In some cases of sacculation of the uterus.
- (d) In an oblique or transverse lie of the foetus.

The uterus may be more enlarged in the following conditions:—

- (a) Hydramnios, acute or chronic.
- (b) Multiple pregnancy.
- (c) Concealed accidental hæmorrhage.
- (d) Severe cases of contracted pelvis in primigravidaë.
- (e) Abnormally big foetuses.
- (f) Tumours of the uterus or adnexa associated with pregnancy.
- (g) Foetal monstrosities or abnormalities such as hydrocephalus, hydrothorax, hydroperitoneum, distended bladder, double monsters, or tumour of the abdomen of the foetus.

These conditions have to be borne in mind in arriving at any conclusion as to the period of pregnancy calculated from the height of the uterus.

(3) *The length of the foetal ovoid* can be directly measured during the second half of pregnancy by calipers, one blade of which is placed over the lower pole of the foetus and the other over the upper pole near the fundus of the uterus. The length of the foetal ovoid gives some idea of the period of gestation. Thus by doubling the measurement thus obtained in centimetres and subtracting 2 cm. for the thickness of the soft parts, one arrives at the length of the foetus and from this may be deduced the period of pregnancy. After birth, however, the age can be ascertained by direct measurement of the length of the foetus.

An easy rule that may be applied after delivery is as follows: ascertain the length of the foetus in centimetres, and note that the length is generally the square of the number of the lunar month up to the fifth month, and thereafter it is obtained by multiplying the number of the month by 5. Thus, at the fourth month, the length will be 4 x 4 or 16 cms.; at the seventh month, 7×5 or 35 cms.

(4) *From the Date of "Quickening."* Quickening generally occurs about the eighteenth week of pregnancy, and if it can be definitely ascertained, as in multiparæ, the probable period of gestation may be calculated.

How to calculate the Probable Date of Confinement.

(1) *From the Date of the Last Normal Menstrual Period.* Get the actual date of the first day of the last menstruation, add seven days, and count back three months. If a leap year intervenes, add six days only. For example, if the first day of the last menstrual period be 1st October, add seven days, which brings us to the 8th of October, and count back three months, which brings one to the 8th of July. The 8th of July of the succeeding year will then be the probable date of confinement.

(2) *From the Date of "Quickening."* If this can be ascertained definitely, add twenty-two weeks to the date of quickening, which gives the probable date of confinement.

(3) *From the Height of the Uterus.* An approximate idea may be obtained about the probable date of confinement by noting the height of the uterus. In ascertaining the height of the fundus, care must be taken to see that the bladder is emptied, the patient is in a recumbent position, and that the uterus is not contracting at the time of palpation. In all cases where the height of the uterus is approximately that found at the thirty-second week, the patient must be made to sit up to see if there

is any falling forward of the uterus, so as to ascertain whether it is the thirty-second or the fortieth week of pregnancy.

In certain cases, besides those already mentioned, the height of the uterus may not give an exact indication of the period of pregnancy. In cases where the back of the foetus is posterior, the flattening of the abdominal wall and the consequent change from the normal contour of the uterus gives rise to some error in the calculation of the probable date of confinement. In cases where the gravid uterus is pushed to one side, generally to the right the height of the fundus should be ascertained after bringing it to the median position.

(4) *Fixation of the Head.* In normal pregnancy where the pelvis is normal and the foetus is presenting by the cephalic pole, the head generally becomes fixed two or three weeks before the onset of labour in a primipara and within forty-eight hours of the onset of labour in a multipara. Fixation of the head, therefore, is an aid in calculating the probable date of confinement in both classes of cases.

Postmaturity. The period of gestation may in some cases be prolonged. A diagnosis of postmaturity should not be made unless labour is delayed beyond 21 days, if the date is calculated from the date of the last normal menstrual period. When the date of conception is more accurately known, a fortnight may be deemed sufficient.

Evidence of postmaturity in the child may not always be clear. Increase in the length of child over 20 inches while the body is thin, increased ossification of the bones of the skull and the skin which is thicker, peeling and stained with meconium—these suggest post maturity in the child.

Foetal deformities such as Anencephaly, Hydrocephaly and spina-bifida are not uncommon in such cases. A large proportion of post mature children are born dead. This is partly due to the placenta ceasing to function after term and partly to dystocia due to increase in size and diminished compressibility owing to ossification of the head.

Diagnosis of Intra-uterine Death of the Foetus. Whether the foetus is alive or dead in utero may be ascertained from the following details;—

(1) *The Foetal Heart.* If this is heard it is a positive sign not only of pregnancy but of foetal life. There are certain conditions where the foetal heart may not be easily audible. Such conditions are:—

(1) Hydramnios.

(2) A fat abdominal wall, particularly with associated oedema.

(3) A distended bladder or flatulence of the intestines.

(4) In malpositions or malpresentations of the foetus

A hurried and casual examination may not reveal the presence of the foetal heart. Care must be taken, therefore, to see that the patient is in the recumbent posture, that the bladder and the bowels are emptied and, if necessary, repeated auscultation must be performed to ascertain definitely the presence or otherwise of the foetal heart. It may not be audible during the height of a uterine contraction in labour. Sometimes the maternal aortic pulsation may be mistaken for the foetal heart. When once heard, absence of foetal heart sounds on subsequent examinations is suggestive of intrauterine death.

(2) *Foetal Movements.* These, when seen or palpated, form a positive sign of the life of the foetus. In some cases the foetal movements are not palpable and may not be seen and the patient herself may not feel them. If there is sudden cessation of foetal movements, and this persists, it is suggestive of intrauterine death of the foetus.

(3) *Cessation of Growth of the Uterine Tumour.* If the uterus does not show any sign of increase in size *puri passu* with the period of amenorrhœa over a period of time, it is strong presumptive evidence that the foetus is dead.

(4) *Retrogressive changes* in the breasts. The breasts cease to grow, become flabby and pendant, and the engorgement of the vessels gradually diminishes. Occasionally secretion of milk may be noted.

(5) Sometimes after intra-uterine death of the foetus the mother may show some signs of toxic absorption such as loss of weight, general malaise and slight rise of temperature.

(6) On palpating the macerated foetal skull it will be found that the bones are freely moveable over each other and the scalp is hanging like a loose bag. This sign can be elicited through the vault of the Vagina, through the cervical canal or rarely through the abdominal wall.

(7) A *radiographic examination* is one of the certain methods of diagnosing intra-uterine death. Where the child is dead for some time and has undergone maceration, overlapping of the bones of the foetal skull, recognisable at a radiographic examination, is almost conclusive evidence. This is known as Spalding's sign. Combined with marked curvature or angulation of the spine and general crowding together of the skeleton it has much value.

CHAPTER VIII

THE FŒTUS IN NORMAL PREGNANCY

THE fœtus or the passenger is one of the important factors concerned in labour, and it is necessary to appreciate correctly the part it plays in the mechanism of labour.

Attitude. The attitude of the fœtus is the relation of the fœtal parts to one another. Ordinarily the fœtus assumes the attitude of universal flexion, thus forming an ovoid mass corresponding roughly to the shape of the uterine ovoid. By this means the space occupied by the fœtus is reduced to the minimum, and it will be seen later that this attitude of universal flexion has an important bearing upon the mechanism of delivery. The spinal column is bent forward, the head is flexed, the chin resting against the sternum, the arms are flexed and folded across the chest, the lower extremities are flexed, so that the thighs are on the abdomen and the legs bent at the knee joint resting on the thighs with the feet crossed in an attitude of dorsi-flexion.

When the fœtal ovoid in this attitude of universal flexion lies longitudinally in the uterine ovoid the uterus is subjected to very little stretching. In such a position the fœtus may have either the head or the breech at the lower pole of the uterus.

Presentation. By presentation is meant that portion of the fœtal ovoid which is in relation to the lower pole of the uterus and is the first to engage in the pelvis when labour starts. The *presenting part* will be that portion of the fœtus which lies lowest and is felt on a vaginal examination when labour has been in progress for some time. Thus the fœtus may present either by the cephalic or by the podalic pole. We then speak of a *cephalic presentation* or a *podalic presentation*. It may sometimes also lie transversely, giving rise to a *shoulder presentation*. When it is a cephalic presentation different parts of the cephalic pole may lie lowest and the presenting part may therefore vary. Thus, depending upon the degree of flexion of the cephalic pole, we may have the vertex, brow, glabella, face, etc., as the presenting part.

The Lie of the Fœtus. We speak of two lies—the longitudinal lie and the oblique or transverse lie. This refers to the relation between the longitudinal axis of the fœtal ovoid and the longitudinal axis of the uterine ovoid. The longitudinal axis of the fœtus is the cephalo-podalic axis. When this axis corresponds to the longitudinal axis of the uterine ovoid the lie is said to be a *longitudinal lie*. When, however, the longitudinal axis of the fœtus

is either oblique or transverse to that of the uterine ovoid the lie is said to be an *oblique* or *transverse lie*.

Position. By this term is understood the relation of the fetus to the maternal pelvis. It is expressed in terms of the position of

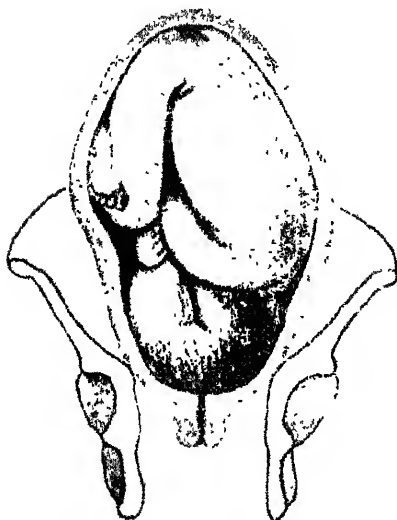


FIG. 22.—Vertex presentation—first position L.O.A.

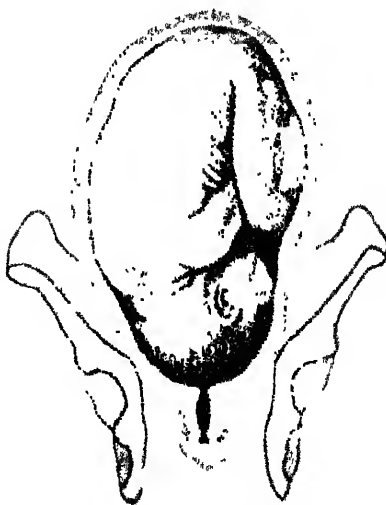


FIG. 23.—Vertex presentation—second position R.O.A.

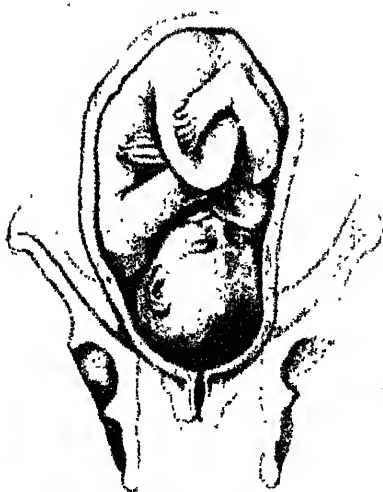


FIG. 24.—Vertex presentation—third position—R.O.P.

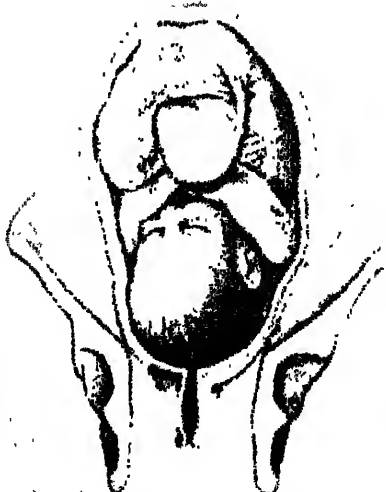


FIG. 25.—Vertex presentation—fourth position—L.O.P.

an arbitrarily chosen part of the fetus to the four quadrants of the maternal pelvis. In the different presentations a particular

landmark, generally a bony landmark, is chosen and called the denominator; and depending upon its position with reference to the four quadrants in the pelvic cavity the position of the fœtus *in utero* is determined. The four quadrants in any plane of the pelvic canal may be divided into the two right quadrants and the two left quadrants—these being the right anterior and right posterior, the left anterior and left posterior. The landmarks chosen as the denominators vary with the particular presenting part.

In cephalic presentation, when the vertex presents, the denominator is the *occiput*. When the *face* presents the denominator is the *chin* or *mentum*. When the *brow* presents the *frontal eminence* is the denominator. In *pelvic presentations* the denominator is the *sacrum*; and in *shoulder presentations* the denominator is the *acromion*.

Besides these four positions there are two others—the right lateral and left lateral—so that six positions may be described with reference to the denominator and the maternal pelvis:—

Left anterior.	Right anterior.
Left lateral.	Right lateral.
Left posterior.	Right posterior.

Taking, therefore, the different presentations the following positions are possible:—

Cephalic Presentations

(1) *Vertex*, with the occiput as the denominator:—

Left occipito-anterior.	(L.O.A.)
Left occipito-lateral.	(L.O.L.)
Left occipito-posterior.	(L.O.P.)
Right occipito-posterior.	(R.O.P.)
Right occipito-lateral.	(R.O.L.)
Right occipito-anterior.	(R.O.A.)

(2) *Face*, with the chin or mentum as the denominator:—

Right mento-posterior.	(R.M.P.)
Right mento-lateral.	(R.M.L.)
Right mento-anterior.	(R.M.A.)
Left mento-anterior.	(L.M.A.)
Left mento-lateral.	(L.M.L.)
Left mento-posterior.	(L.M.P.)

(3) *Brow*, with the brow or the frontal eminence as the denominator:

Although theoretically the same six positions may be possible, it is usual to recognise, for clinical purposes, only two positions:—

- (i) The brow to the right; and
- (ii) The brow to the left.

This is due to the fact that in brow presentation the diameter of engagement, which is the longest of the fetal skull, can engage only in the transverse diameter, the longest at the brim.

Podalic or pelvic or breech presentations. with the sacrum as the denominator:—

Left sacro-anterior.	(L.S.A.)
Left sacro-lateral.	(L.S.L.)
Left sacro-posterior.	(L.S.P.)
Right sacro-posterior.	(R.S.P.)
Right sacro-lateral.	(R.S.L.)
Right sacro-anterior.	(R.S.A.)

Shoulder Presentations. Here the acromion is usually the denominator, and four positions are possible:—

Left acromio-anterior.	(L.A.A.)
Left acromio-posterior.	(L.A.P.)
Right acromio-posterior.	(R.A.P.)
Right acromio-anterior.	(R.A.A.)

So far as oblique lies are concerned, it may be stated that there are two possibilities. The cephalic pole or the podalic pole may be the more dependent in any of these positions, with the other on the opposite side and above. When the podalic pole is lowest the breech will slip into the pelvic brim at the time of labour thus resulting in spontaneous version.

Compound Presentations. Here more than one part of the foetus will present.

The Foetal Head and its Diameters. The passage of the foetal head through the maternal pelvis is the most important factor in the delivery of the child. A careful study of the foetal head is therefore essential to appreciate the part it plays in the mechanism of labour and the difficulties that may arise in the course of delivery. (Fig. 13, page 25.)

The foetal skull consists of the vault, the base and the face. The vault of the skull is the portion above, which is subject to some degree of compression. The bones that go to form the vault of the skull are the two frontal bones, the two parietal bones, the occipital bone, the two temporal bones and the wings of the sphenoid. These bones are not firmly united together by bony union. In between two bones is a thin piece of membrane which is spoken of as a *suture*. Where two or more sutures meet

there is a wider expanse of membrane, and this is termed a *fontanelle*.

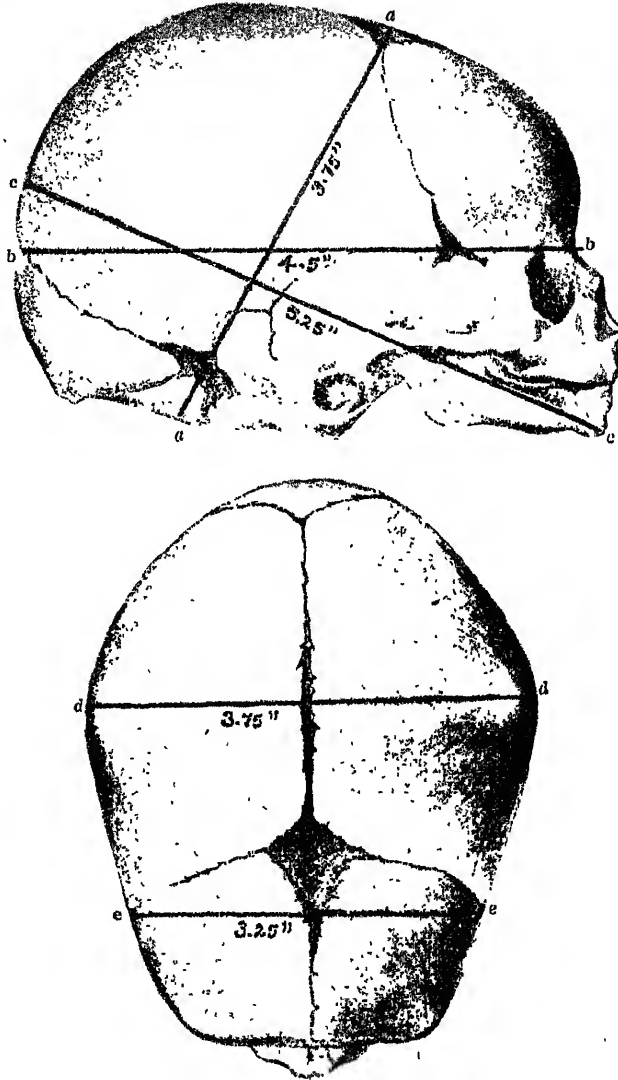


FIG. 26.—Diameters of the foetal skull.

aa. Suboccipitobregmatic. cc. Supra-occipitomenal. ee. Bi-temporal.
bb. Occipito-frontal. dd. Bi-parietal.

Thus we have:—

- (1) The *frontal suture*, situated between the two frontal bones.
- (2) The *sagittal suture*, situated between the two parietal bones.

- (3) The *coronal suture*, situated between the frontal and parietal bones.
- (4) The *lambdoidal suture*, situated between the posterior margins of the parietal bones and the occipital bone.
- (5) The *temporal suture*, situated on either side between the inferior margin of the parietal bone and the upper margin of the temporal bone of the corresponding side.

When the cephalic pole of the foetus presents, one or other of the sutures can be felt except the temporal suture. The direction of the sagittal suture in the maternal pelvis, and its relative position with reference to the oblique or transverse diameters of the pelvis, are of importance in determining the nature and extent of abnormality, if any, in the position of the foetal head.

There are four fontanelles which can be made out:—

(a) The *anterior fontanelle* or *bregma* is a lozenge-shaped space situated at the junction of the sagittal and coronal sutures. Four bones can be felt at its edges—the two parietal bones on either side posteriorly and the two frontal bones in front. Three sutures are seen radiating from its centre—the sagittal, the coronal and the frontal.

(b) The *posterior fontanelle* is a smaller triangular area situated posteriorly at the junction of the sagittal and lambdoidal sutures. Three bones can be felt at the margins—the two parietal bones and the occipital bone, and its position with reference to the maternal pelvis forms an important landmark in differentiating the different positions of a vertex presentation.

(c) The *temporal or sphenoid fontanelle* is situated at the junction of the lambdoidal and temporal sutures.

(d) Occasionally a lozenge-shaped space, smaller than the bregma, is found in the sagittal suture midway between the anterior and posterior fontanelle. This is sometimes spoken of as the *sagittal fontanelle*. It is not, however, a true fontanelle as it is not the result of the meeting of two or more sutures but is due to faulty ossification. It is of some clinical significance, as it may be mistaken for the anterior fontanelle. Such a mistake should not arise if the fontanelle be carefully palpated, and the sutures that should radiate and the bones that should meet are remembered.

DIAMETERS OF THE FOETAL SKULL

Certain diameters of the foetal skull are important as they give an idea of the shape and size of the foetal skull and an approximate measurement of the circumference. The diameters of the foetal skull commonly taken into consideration are:—

(1) The *suboccipito-bregmatic*. This measures $3\frac{1}{2}$ ins. (9.4 cm.) and is the distance between the middle of the anterior fontanelle and a point just below the occipital protuberance. This is the diameter of engagement in a *vertex presentation*. The circumference of the foetal head at this plane measures 11 ins. (27.5 cm.).

(2) The *cervico-bregmatic* or *submento-bregmatic diameter* is the distance between the middle of the anterior fontanelle and a point that represents the junction of the chin and neck. It measures $3\frac{1}{2}$ ins. (9.4 cm.) and is the diameter of engagement in a *face presentation*.

(3) The *occipito-frontal* diameter is the distance between the root of the nose or glabella and the most prominent point on the occipital protuberance. It measures $4\frac{1}{2}$ ins. (11.25 cm.) and is the diameter which tries to engage when the head is in an attitude of deflexion in a vertex presentation. The circumference measures at this plane $13\frac{1}{2}$ ins. (34 cm.).

(4) The *vertexo-mental* or *supra-occipito-mental* is the distance between the tip of the mentum or chin and the most distant point of the occipital bone. This is the longest diameter of the foetal skull, measuring $5\frac{1}{2}$ ins. (13 cm.), and is the diameter of engagement in a *brow presentation*. The circumference around this diameter measures 15 ins. (37.5 cm.).

(5) The *biparietal diameter* is maximum distance between the two parietal eminences. It measures $3\frac{1}{2}$ ins. (9.4 cm.).

(6) The *bitemporal diameter* is maximum distance between the two temporal bones. This measures $3\frac{1}{2}$ ins. (8 cm.).

It is well to remember that the foetal head is capable of moulding during labour because of the membranous union between the bones of the vault of the skull. Consequently, over-riding of the bones occurs, the diameters become slightly shortened and the circumference diminished in size.

The base of the skull is made up of several bones united by firm bony union, and cannot therefore be diminished in size.

The face is likewise made of bones united firmly and is incapable of compression. The skull may be unduly ossified, when the foetus is over-mature. The sutures then are not so wide and the extent of moulding is considerably diminished. Greater difficulty is then experienced in the delivery of the foetal head, unless the maternal pelvis is proportionately roomy.

FREQUENCY OF THE PRESENTATIONS AND POSITIONS

It has been found that vertex presentations preponderate and occur in nearly 96 per cent. of the cases, whereas pelvic

presentations occur in less than 3 per cent., face 0.5 per cent. and shoulder about 0.5 per cent.

Amongst the vertex presentations the position that is most commonly adopted by the foetus is the left occipito-anterior, 70 per cent. coming under this category. The group next in frequency is the right occipito-posterior position, occurring in over 25 per cent. of the cases. The rest of the cases are either left occipito-posterior or right occipito-anterior.

It must, however, be realised that the position is likely to change during the course of labour; that ordinarily early in labour one may meet with an occipito-posterior, but as labour progresses the position changes to an occipito-lateral and finally to an occipito-anterior. It is on account of this factor that some confusion arises as to what exactly the position of the foetus was at the time the patient went into labour.

Causes which influence the Frequency of a Cephalic Presentation. Several theories have been put forward to account for the preponderance of cephalic presentations, particularly vertex. There are two factors which are probably responsible: (1) The effect of gravity and (2) the necessary adjustment between the foetal ovoid and the uterine ovoid so as to allow for the most comfortable position for the growing foetus.

Gravity has been realised for some time to be one factor concerned in the production of cephalic presentations at term. It will be seen that when labour occurs prematurely the frequency of abnormal presentations is much greater. It is also known that where the foetus is dead, podalic presentations occur not infrequently. It has therefore been suggested that in the later weeks of pregnancy because the head is the heaviest portion of the foetal ovoid gravity would help to bring it to the lower uterine pole. On the other hand, the persistent tendency for the foetal ovoid to accommodate itself to the uterine ovoid is better exemplified by the preponderance of podalic presentations when the foetus is dead. The foetus *in utero* is generally active and moving, and tends to adapt the foetal ovoid to the uterine ovoid so as to ensure a comfortable position. In the early months there is enough space and the liquor amnii is sufficiently in excess as compared to the size of the foetus, to allow of free movement; but in the later weeks the growing size of the foetal ovoid makes it more difficult for the foetus to move so freely, and consequently the movements of the foetus help to restrict the position to the most comfortable one that can be adopted within the uterine ovoid.

Among the causes of abnormal presentations and positions may therefore be mentioned prematurity, variations of the uterine ovoid such as occur when the uterus is overdistended, as from

hydramnios or twins; also a flaccid uterus with a lax abdominal wall as in multiparæ, when there is not the same necessity for adjustment of the foetal ovoid to the uterine ovoid; abnormalities in regard to the foetus itself would naturally interfere with the adjustability and account for variations. Contracted pelvis, tumours of the lower uterine segment, placenta prævia are all factors which interfere with the natural adjustment of the foetal ovoid to the uterus and therefore give rise to anomalies in position and presentation.

METHODS OF OBSTETRIC DIAGNOSIS

The methods of obstetric diagnosis are:—

- (1) Inspection.
- (2) Abdominal palpation.
- (3) Auscultation.
- (4) Vaginal examination or bimanual examination.
- (5) Rectal examination.
- (6) Radiography.

It is a time-honoured practice to resort to abdominal palpation and auscultation for the diagnosis of the presentation and position of the foetus, and except in cases of difficulty it is not justifiable to resort to a vaginal examination. Radiography helps to an easy recognition of the presentation and position, but it is to be hoped that these modern methods of easy diagnosis will not be used to the exclusion of the older methods, as the obstetrician must still rely on obstetric palpation for a complete diagnosis.

(1) **Inspection.** This is useful and must never be omitted. Inspection will reveal whether the uterine ovoid is longitudinal, oblique or transverse; whether there is overdistension as in cases of hydramnios or twins and whether any tumours are present.

(2) **Abdominal Palpation.** This must be done systematically with the patient lying on her back with the thighs flexed. The height of the fundus should first be noted, as it gives an approximate idea as to the period of pregnancy. With the abdomen laid bare from the ensiform cartilage to a little below the symphysis pubis the obstetrician should proceed to palpate, facing the patient. The palms should be laid gently, one on either side of the abdomen taking care to see that they are not too cold so as to provoke contraction of the abdominal or uterine muscles and thus prevent effective palpation.

After outlining the contour of the uterus and noting the height of the fundus, the first manœuvre is to determine the part of the foetus at the fundus. This is known as the *fundal palpation*.

grip it will be possible to note whether the podalic or the cephalic pole is situated here, the head being generally harder, more round and more freely movable and ballotable.

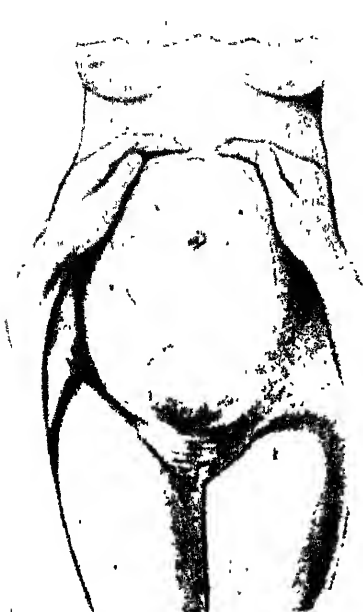


FIG. 27.—Methods of abdominal palpation—fundal grip.



FIG. 28.—Methods of abdominal palpation—umbilical grip.

The second grip or the umbilical grip. Having determined which pole of the foetus is situated at the fundus, the examiner places the palmar aspects of the hands on either side of the umbilicus and gently palpates. On one side he will generally feel a hard, resistant surface, probably slightly curved, which is the back; on the other side a number of nodules will be felt which are the limbs. In some cases these nodules may be felt on both sides of the umbilicus. This indicates a posterior position that is, one where the back is situated posteriorly and the limbs are anterior.

The third and fourth grips are very important, as they give many valuable data for obstetric diagnosis.

The third grip is spoken of as the *Pawlik's grip*. The examiner grasps the lower portion of the abdomen just above the symphysis pubis between the thumb and fingers of one hand, and by gently pressing the part enclosed between, finds out which part of the foetus is presenting. If the cephalic pole is presenting, this will be felt as a hard, round mass, which if not engaged in the pelvic brim may ballot independently of the foetal body. If the breech

is presenting, it will be found to be much larger in size, softer in feel and moving with the rest of the body. If the head is felt, a careful palpation may elicit the bony landmarks, namely, the



FIG. 29.—Methods of abdominal palpation—Pawlik's or the first pelvic grip.

occiput and the sinciput; and depending upon the relative positions of these, it is possible to determine whether in a cephalic pole it is the vertex, the brow, or face that is presenting. If the sinciput is at a higher level than the occiput, the vertex is presenting; if the sinciput and the occiput are on the same level, the brow is presenting; if the sinciput, on the other hand, is on a lower level than the occiput, the face is presenting.

The *fourth grip* or the *second pelvic grip*. This is very useful, not only to confirm the findings of Pawlik's grip but also to determine other points of obstetric importance. In this grip the examiner faces the patient's feet, and with the tips of the fingers of each hand, makes deep pressure in the direction of the pelvic brim. Care should be taken to see that the thighs are semi-flexed, the abdominal muscles are relaxed, and the fingers on either side dipped deep down, with a view to get more intimately in touch with the presenting part of the foetus. On a careful palpation, if the head is presenting, it will be seen that the fingers of one hand get into touch with the occiput and those of the other hand with

the sinciput. The relative positions of these two bony landmarks in the different presentations have already been referred to.



FIG. 30.—Methods of abdominal palpation—second pelvic grip.

This grip enables one to recognise whether the presenting part has descended into the pelvis, and if so, how far; also to note out whether there is any disproportion between the presenting part and the brim of the pelvis.

To sum up, the second pelvic grip enables one to recognise

- (1) Whether the cephalic or the pedalic pole is presenting, whether it is a transverse or an oblique lie.
- (2) If it is a cephalic presentation, whether it is the vertex or brow that is presenting.
- (3) If the presenting part has entered the brim of the pelvis and during labour, trace its descent.
- (4) The presence of disproportion, if any, between presenting part and the pelvis.

It is so valuable for purposes of obstetric diagnosis that we have for some time given up the practice of palpating in the other manner mentioned. We start with the second pelvic grip first, the object being to prevent stimulation of the abdominal muscles, which

occasionally happens during the routine palpatory method suggested above. If the abdominal muscles are fairly lax, the second pelvic grip will help us to recognise in the majority of instances,

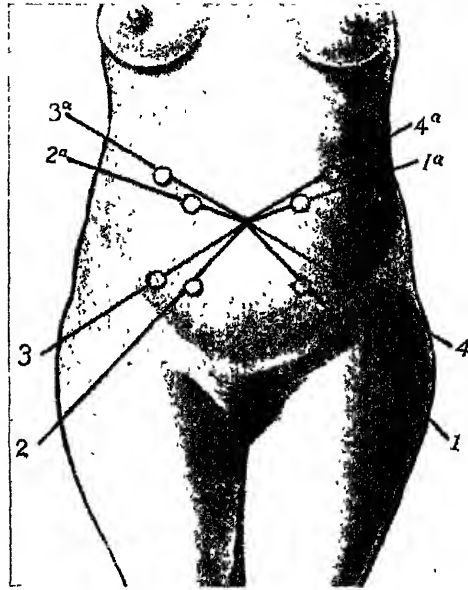


FIG. 31.—Position of foetal heart in the various positions of vertex and breech presentations.

along with Pawlik's grip if necessary, the exact presentation, position, disproportion if any, and progress in labour.

(3) **Auscultation.** This helps us to diagnose whether the foetus is alive, and by a careful recognition of the point of maximum intensity of the foetal heart sounds, to locate also the position of the foetus. Many other subsidiary sounds that are heard by auscultation have been referred to elsewhere. It may be mentioned as a general rule that the point of maximum intensity of the foetal heart sound is below the umbilicus in all cephalic presentations; above the umbilicus in podalic presentations; and almost on a level with the umbilicus in oblique or transverse lies. The position also varies with reference to the position of the back of the foetus. In cases where the back is to the left or right, the foetal heart sounds are heard on the same side, nearer the middle line in anterior positions, and farther away in posterior positions.

(4) **Vaginal Examination.** Vaginal examination is not generally useful during the course of pregnancy, except that occasionally by internal ballotement pregnancy can be diagnosed, and in some cases by palpating through one or other fornices it

may be possible to know whether the cephalic pole is the most dependent part or not.

A single vaginal examination is permissible in the latter half of pregnancy to ascertain the presence of any abnormalities either of the soft parts or of the bony pelvis.

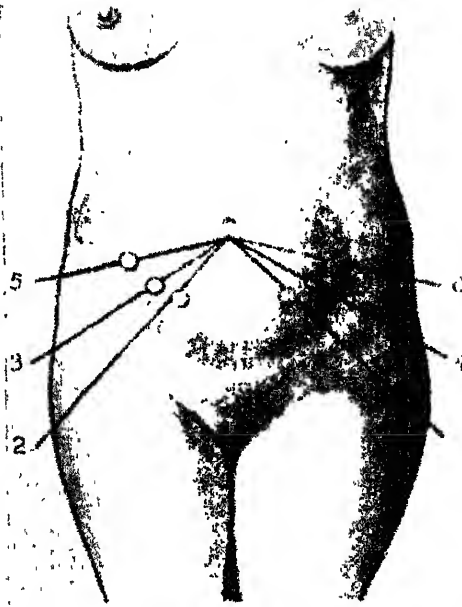


FIG. 32.—Position of fetal heart in the several positions of vertex presentation.

Ordinarily, a vaginal examination should not be necessary in the course of labour. The danger of introducing infection, no matter how careful one may be in making such an examination, necessarily restricts its adoption as a routine method of obstetric diagnosis. In some cases, however, it is inevitable that a vaginal examination should supplement other methods of obstetric diagnosis to get a correct appreciation of the presentation and position, and sometimes the stage of labour. It is useful in some cases of prolonged labour when the uterus is tonically contracted, or in cases where the uterus is overdistended as in hydramnios that abdominal examination, or where the progress of labour cannot be judged correctly by other methods. The appropriate preparation for vaginal examination has been dealt with in another chapter (XII) and the information that could be gathered has also been detailed. A vaginal examination has its uses, but should be done with extreme caution.

(5) **Rectal Examination.** The danger of a vaginal examination, namely, the possibility of sepsis, has made it desirable to resort to rectal examination. We do not share the same optimism as some others about the comparative safety of rectal examination.

(6) **Radiography.** This is a very valuable diagnostic aid and should be resorted to whenever necessary. In primiparæ, hydramnios, twin pregnancy, women with fat abdominal walls, and in cases complicated with tumours it is a useful aid to diagnosis.

The place of radiography in obstetric diagnosis is dealt with elsewhere.

CHAPTER IX

ANTENATAL CARE

THE subject of antenatal care has been receiving increasing attention in recent years and is an important advance in obstetrics. The proper care of the mother from the time pregnancy is diagnosed has materially reduced maternal and foetal mortality and morbidity. In fact, in some countries this has been so thoroughly realised, that a compulsory notification of pregnancy is required by law to enable civic authorities to take such measures as may be necessary to look after the expectant mothers. It is often thought that antenatal care is necessary only in the latter half of pregnancy; but serious abnormalities may occur in the earlier period as well, and we would emphasise that a woman, as soon as she suspects the possibility of pregnancy, should consult an obstetrician or attend an antenatal clinic.

ANTENATAL CARE IN THE FIRST HALF OF PREGNANCY

During this period certain particulars ought to be noted. The first essential is to diagnose the existence of pregnancy, as not infrequently women with varying periods of amenorrhoea may imagine that they are pregnant and seek antenatal advice or confirmation of the fact of pregnancy.

Secondly, one should note whether pregnancy is intra-uterine or extra-uterine. Comparatively rare as the condition of extra-uterine pregnancy is, it should, however, be realised that great harm may result from overlooking it, and if a routine examination were made in every case between the sixth and eighth weeks of pregnancy, extra-uterine gestation might be diagnosed before any of the serious catastrophes could occur.

Thirdly, it is also necessary to diagnose in cases of intra-uterine pregnancy, whether it is proceeding in a normal manner. Thus, vesicular mole, retroverted gravid uterus, tendency to sacculation of the uterus, angular pregnancy, pregnancy complicated with tumours may all be diagnosed in the early half of pregnancy and suitable treatment adopted.

Certain so-called physiological changes of pregnancy may tend to become pathological. Thus, it is not infrequent that "morning sickness" may become exaggerated and may take on the form known as "hyperemesis gravidarum." In cases where pregnancy occurs in women suffering from heart disease, tuberculosis, etc., the question may have to be decided at an early stage of pregnancy, whether the condition is such as to permit the pregnancy to continue, or whether measures may not be necessary to terminate it. Syphilis is another of those complications where it is most desirable to take early measures to treat the condition with a view to save the foetus. Not infrequently abortion or miscarriage may occur in the first half of pregnancy as a result of the syphilitic virus infecting the foetus and placenta.

Apart from all these pathological conditions it is desirable, especially in a primigravida, to offer some advice as to the regulation of her activities. Young women, unaccustomed to any particular restraint, may not realise that during pregnancy there are certain limitations to exercise, and proper regulation of diet, sleep, bathing, care of the bowels, etc., are necessary. It should be the duty of the obstetrician at this period to offer them advice on these points.

It will therefore be seen that a routine examination of all pregnant women as early as possible is of great advantage and will aid in the early detection and treatment of abnormalities.

ANTENATAL CARE IN THE LATTER HALF OF PREGNANCY

Usually, antenatal advice is more often sought in the latter half of pregnancy. If antenatal care is to be effective, it should not be restricted to an occasional visit to the clinic, but the patient should be kept constantly under observation and should be treated in an institution if any signs or symptoms of complications occur. It is our rule to insist upon the expectant mother attending the antenatal consultation room at least once a month from the twentieth week onwards, and after the thirty-second week once a fortnight, provided there are no untoward complications to report. In the last four weeks of pregnancy we prefer her coming once a week. In spite of all this care, accidents occasionally occur, to which we shall refer later.

The advantages of systematic examination in the latter half of pregnancy are:—

(1) A routine general examination of the patient will furnish evidence of abnormalities in any of the systems which may need attention. In the absence of such abnormalities, the obstetrician and the patient feel a sense of security that no complications are likely to occur. From the patient's point of view it relieves her of anxiety and keeps her in a proper frame of mind, and so enables her more easily to go through pregnancy and stand the strain of labour. We cannot overemphasise the fact that it is of the utmost importance to gain the confidence of the patient and make her feel that she is progressing normally and is in safe hands.

(2) A full record of her history, with careful pelvimetry, and a correct diagnosis of the presentation and position of the foetus, will enable the obstetrician to correct any abnormalities and to be better prepared to manage the case during labour. Nothing is more disconcerting than to find surprises once labour has begun. Further, such complications may only be recognised at a stage in labour when it is too late to think of certain remedies, and of necessity other measures risky to the mother or to the foetus may have to be adopted.

(3) The routine examination of the urine, of the blood-pressure, weight, etc., will help one to determine whether the patient is developing any form of toxæmia, and whether the much dreaded complication of eclampsia may appear.

(4) The proper diagnosis of venereal diseases and their treatment are absolutely essential in the interests of the foetus as well as the mother.

(5) A thorough hæmatological examination of the patient enables us to rectify any defects and improve the general health so that she is better able to stand the strain of labour.

We shall now consider the routine examination that ought to be made at an antenatal clinic, when the expectant mother presents herself, let us say, at the twenty-fourth week of pregnancy.

History. This is most important. It consists of—

- (a) History of childhood.
- (b) History of previous pregnancies and labours.
- (c) History of present pregnancy.

The *history of childhood* is important, as it may furnish the obstetrician with information about the occurrence of certain diseases in childhood resulting in abnormalities likely to adversely affect the woman when pregnant. Among these factors, rickets is the most important. This affects the development of the pelvis and leads to various deformities which are dealt with at length in

a later chapter, and should therefore suggest a careful investigation of the pelvis. History of injuries, of any infectious fevers such as anterior poliomyelitis leading to paralysis of one or other of the limbs, acute rheumatic fever leading to cardiac sequelae, etc., furnish valuable indications for further investigation.

History of Previous Pregnancies and Labours. This should always be obtained in a multipara. The number of children that have been born, the nature of the deliveries and the complications, if any, should be noted. In cases where the children are born alive, the fact should also be ascertained whether they continued to live or whether they died in the neonatal period. A history of live birth, followed by neonatal death, suggests some form of obstructed labour, not necessarily sufficient to require artificial aid but enough to cause damage to the foetus though delivered by the natural passages. When a history of live birth is given, it should be ascertained whether the child was born prematurely or at term and the weight of the child should be obtained. We have had cases where a woman has given a history of one or two deliveries with children born alive and which continued to live, while in the third or subsequent delivery there has been great difficulty in labour. On closer investigation it was found that the earlier pregnancies ended prematurely and the children weighed less than 5 lbs., while in the last pregnancy it was a full-term baby weighing 7 to 8 lbs., and this explained the difficulty.

In cases where the delivery has been assisted, the nature of the difficulty and the mode of interference should be ascertained. We have made it a rule that in every case where artificial assistance has been given, the patient should be furnished with a note giving the exact particulars of the delivery, with the opinion of the attendant obstetrician as to the cause of delay, the nature of artificial aid given, with a suggestion as to the possible mode of delivery in subsequent pregnancies. We consider it is the duty of every obstetrician to furnish this information to the patient and ask her to show it to the next obstetric attendant, should the necessity arise. For example, not infrequently we have advised that a subsequent delivery at term should be by Caesarean section, having noted the difficulties of vaginal delivery of a full-time child.

History of Present Pregnancy. This should always be elicited carefully both in multiparae and primiparae. A history of excessive vomiting, or of any other complications in the earlier part of pregnancy, such as malaria, influenza, etc., would be of help in ascertaining the exact condition of the patient and the possibility of further complications occurring. A history of pyelitis, of repeated attacks of slight hæmorrhage, of threatened abortion, headaches, oedema, or dimness of vision should all be noted.

General Examination. Having ascertained the history of the patient, the next step is a thorough general examination. All the systems should be carefully examined—the circulatory, respiratory, urinary and nervous systems. The urine should be examined as a matter of routine, particularly for albumin. The total quantity of urine passed may have to be ascertained in some cases. The presence of sugar may also be noted, especially if the specific gravity is high. We make it a rule that the patient should get her urine examined at least once a fortnight between the twenty-fourth and thirty-second weeks, and once a week thereafter. In spite of this we have noted not infrequently the sudden appearance of albuminuria. In some cases diminution in the quantity of urine may be noted, and the patient should be cautioned to seek immediate medical advice if symptoms like headache, dimness of vision, nausea, etc., appear.

Hæmatological Examination. We advocate a thorough hæmatological examination, particularly in the tropics, as a matter of routine of every woman attending an antenatal clinic. So frequent is the incidence of anæmia, and so serious the results of any neglect of this condition, that we think it wise to insist on a hæmatological examination. This should include the following:—

- (a) Estimation of the hæmoglobin percentage.
- (b) Estimation of the total number of leucocytes and red blood corpuscles.
- (c) A differential count of the leucocytes, if necessary.
- (d) When any definite evidence of anæmia is present, that is, when the hæmoglobin percentage is less than 80, a more detailed examination of the blood should be made on the lines suggested in the chapter on Anæmias complicating Pregnancy.

Examination of the motions for the presence of ova of hook worms, round worms, etc., is also an invariable necessity in the tropics, especially if anæmia is noted.

Serological Tests. It is best as a matter of routine to send the blood for Wassermann and Kahn tests, although clinically syphilis may not be so obvious. From the point of view of the foetus it is of the utmost importance that this fact should be ascertained as early as possible, to enable proper antisyphilitic treatment to be adopted.

Weight. The weight of the pregnant mother should be taken periodically. It is now known that any rapid increase in weight is due to occult oedema, which is likely to be associated with toxæmia. The total increase in the weight of a pregnant woman should not exceed 20 lbs., and the increase in weight in any month should ordinarily not exceed 5 lbs.

Blood-Pressure. We advise that both systolic and diastolic pressures should be noted on every occasion the patient attends the antenatal clinic. Hypertension is a complication of bad prognostic significance. Every case of hypertension must be thoroughly investigated to see if there is an underlying toxæmic factor. Even in the condition known as "essential hypertension," care should be taken that the patient's diet is regulated, that she gets sufficient rest, and that the hypertension is not allowed to persist for a long period. The normal blood-pressure may vary between 110 and 120 mm., systolic. Anything over 140 mm. systolic or 90 mm. diastolic is suggestive of some form of toxæmia, and if the systolic be above 160 mm or the diastolic 100 mm or above, the patient should preferably be hospitalised and treated. We do not think it desirable that such a case should be treated as an out-patient. Even in the absence of albumin in the urine it is very necessary that she should be promptly hospitalised kept at rest, dietetic restrictions imposed, bowels thoroughly moved and periodic blood-pressure records maintained. We know of several cases where albuminuria has occurred after the first fit, and we know of cases where albuminuria did not set in twenty-four hours after the onset of eclampsia.

Other particulars to be noted are the condition of the teeth, signs of any focal infection, presence or otherwise of any vaginal discharge, œdema of the labia, varicosity of the veins, the condition of the nipples and the breasts, and any other abnormalities that may be recognised in the course of a thorough examination of the patient.

OBSTETRIC EXAMINATION

The next procedure is the obstetric examination. This consists in noting the following:—

The Height of the Uterus. This varies with the period of pregnancy and may be altered by any complications. The height of the uterus is not always a safe guide to the period of pregnancy, as in cases of hydramnios, concealed accidental hæmorrhage, twins, monsters and tumours of the uterus complicating pregnancy, the uterus may be much bigger than normal; on the other hand, it may be much smaller than normal in cases of intra-uterine death of the foetus and oligo-hydramnios. It should be realised that in the earlier weeks conditions like vesicular mole may increase the size of the uterus, while in ectopic gestation and in cases of missed abortion the uterus may be much smaller.

Abdominal Palpation and Auscultation. This must be done as a matter of routine and the observations recorded. The pre-

sentation and position of the foetus should be ascertained by palpation and the condition of the foetus by auscultation of the foetal heart. Not infrequently in the earlier part of the second half of pregnancy the position of the foetus may vary from time to time; thus, the foetus may be presenting as a breech, sometimes as a shoulder, or the head may not be flexed. We do not think there is any purpose in unnecessarily getting alarmed and, what is worse, alarming the patient by mentioning these various abnormalities. So frequently do they occur before the thirty-second week, but correct themselves by the thirty-sixth week, that we have ceased to look upon them with any degree of apprehension and do not communicate these findings to the patient. We have frequently had patients referred to us in a condition of great mental excitement because of the injudicious remarks of the obstetrician that something serious was likely to occur because an abnormal presentation or position was noted in the second or early part of the third trimester. Before the thirty-sixth week of pregnancy the foetus frequently changes its position. Still, when abnormal presentations are noted, care must be taken to see that no important factors which could account for them are missed.

A word of caution is, however, necessary. After correction, an abnormal presentation may recur. When such correction has been made the patient should be seen at frequent intervals, and in every case she should be advised that as soon as she has any slight pains she must seek the help of the obstetrician concerned. We do not hold the view that any great purpose is served by correcting an abnormality before the thirty-fourth week of pregnancy; and in the majority of cases such correction of abnormal presentations had better be done between the thirty-fourth and thirty-eighth weeks. We make this statement because so frequently have we noticed the tendency for the foetus to rectify its position spontaneously, that it seems unnecessary to attempt interference earlier, when nature can do it much more satisfactorily and thoroughly without disturbing the attitude of universal flexion.

Pelvimetry. This gives valuable information in judging the possibility of natural delivery. It should be made as a matter of routine in all cases, but especially—

- (1) In primiparae.
- (2) In cases with a history of difficult labour, whether assisted or otherwise.
- (3) In cases of still-birth.
- (4) In cases where the child died in the neonatal period, even though born by natural efforts.

- (5) In cases where accidents, such as fractures of the extremities or of the pelvis, have occurred.

Pelvimetry may be either external or internal.

The external pelvic measurements that should be ascertained are :—

- (1) The intercrystal.
- (2) The interspinous.
- (3) External conjugate.
- (4) Posterior interspinous.
- (5) Inter-trochanteric.
- (6) Antero-posterior diameter of the outlet.
- (7) Transverse diameter of the outlet.

Particulars of these diameters and the method of ascertaining them are furnished in the chapter on Contracted Pelvis.

Internal Pelvimetry. This is of greater value, because it gives the actual measurements of the bony birth canal; but there are certain difficulties in obtaining them. They may be ascertained either by the hand, or by a special pelvimeter, generally Skutsch's internal pelvimeter. The particular diameter that is taken note of, is the true conjugate at the brim of the pelvis. The significance of this measurement and the exact inferences to be drawn from it will be found in the chapter on Contracted Pelvis.

Cephalometry. Whatever may be the pelvic measurements they can only give a general indication of the type of the pelvis one has to deal with. The most important point, however, from the obstetric point of view, is to judge how far a particular head will go through a particular pelvis. In other words, the question is not one of contracted pelvis but one of relative disproportion between the pelvis and the head. For this purpose cephalometry may be helpful; but the most important method of judging whether the head is too big to go through a particular pelvis is the bimanual examination, known as the Munro-Kerr-Müller method, of trying to fit the cephalic pole into the pelvis and noting, if any, the extent of overriding.

If all these different observations are recorded at the antenatal clinic on the first and subsequent occasions on which the expectant mother seeks advice, much useful information will be available to enable the obstetrician to come to some conclusions regarding the probable nature of the delivery. It is important, however, to emphasise the fact that the pregnant woman must attend the antenatal clinic at regular intervals; and, as we have noted already, these intervals should not be less than a month before the thirty-second week, a fortnight between the thirty-second and thirty-sixth

week, and a week thereafter. At each visit the following routine examination should be made:—

- (1) Urine examination.
- (2) A record of blood-pressure, systolic and diastolic.
- (3) Hæmoglobin estimation, if necessary.
- (4) A careful palpation to ascertain the lie, position and presentation of the foetus.
- (5) Auscultation of the foetal heart to ascertain the condition of the foetus.
- (6) Weight of the mother.

A survey of the general condition of the patient, with a view to detect any other anomalies should also be made. Where any defects have been noted, attention must be concentrated upon them.

ADVICE TO THE EXPECTANT MOTHER

We shall now deal with the advice that is to be given to the expectant mother when she visits the antenatal clinic.

Impress upon her the need for regular attendance at the clinic and assure her that if some simple physiological laws are followed, the course of pregnancy will be smooth and labour will be safe. We do not hold that unnecessary alarm should be raised even in the presence of minor ailments, as we consider that one of the most essential factors for success is the right mental attitude of the expectant mother. The obstetrician should emphasise in simple language certain signs or symptoms, the appearance of which must necessitate an immediate consultation. He can assure the pregnant woman that if proper steps are taken in time the symptoms will abate and there need be no unnecessary anxiety.

The following points have to be borne in mind by the pregnant woman:—

Diet. The diet of a pregnant woman should preferably be light and nutritious and should besides supplying the chief proximate principles, provide the necessary vitamins and the calorie requirements of the mother. A daily intake of about 2,500 to 2,800 calories meets the total energy needs of the average pregnant woman. A low calorie diet may be necessary for the very obese pregnant woman. In such case the calorific value of the diet only should be limited without reducing the quantity of proteins, minerals and vitamins. This requires special dietary calculations.

The pregnant woman should be warned against two forms of advice frequently given by overanxious relatives and friends; that she should eat largely because to ensure that both the foetus and the mother are nourished or that she should eat sparingly to limit the size of the foetus.

Any attempt to restrict the intake of food carries with it the serious risk of inducing nutritional deficiencies in both mother and child. There is a much higher incidence of miscarriage, still births, premature births and minor complications in women with poor diets throughout pregnancy than in others.

The daily dietary requirements of a normal pregnant woman doing light housework during the second half of pregnancy is as follows:

Calories . . .	2,400-2,800.	Vitamin A	6,000 I-U
Protein . . .	80-100 gm.	" B-1	500-1,000 I-U
Fat . . .	80-100 gm.	" B-2	3-3.5 mg
Carbohydrates	350-400 gm.	" C	50-75 mg.
Calcium . . .	1.5 gm.	" D	500-1,000 I-U.
Iron . . .	0.020 gm.	" E	
Iodine . . .	in iodised salt.		

In pregnancy there is a greatly increased demand for vitamins as compared with the non-pregnant woman. Vitamin A, the growth and anti-infective vitamin is of great value in pregnancy. Its deficiency results in night blindness (Hemeralopia) and Xerophthalmia, and to intercurrent infections due to lowered power of resistance. It is a fat soluble vitamin, not destroyed by heat and is present abundantly in milk, butter, cream and cheese and among root vegetables. Cod liver and other fish oils and liver are extremely rich sources of vitamin A.

Vitamin B complex consists of a number of closely allied vitamins which are distinguished as B₁, B₂, B₆, etc. Children, pregnant and nursing women require a specially high Vit. B intake—Deficiency of this vitamin gives rise to a variety of symptoms, the chief of which are muscle cramps, diarrhoea, palpitation, dyspnoea, numbness and tingling, nervousness, depression and burning sensation of various parts. Signs of peripheral neuritis may develop later.

Vitamin B₂ deficiency may be one of the causative factors in the macrocytic anaemia of pregnancy. It has no anti-neuritic properties. These vitamins can be obtained in synthetic form and various preparations are available in the market for oral or intramuscular use.

Vitamin C is watersoluble and has anti-scorbutic properties. It is found in fresh fruit juice, particularly orange juice. Deficiency of vitamin C in pregnancy may lead to abortion or to various manifestations of scurvy.

Vitamin D is responsible for controlling the deposition of calcium and phosphorus in the tissues. Its specific use is in the prevention of rickets. The richest source of vit. D is cod liver oil.

Vitamin E is fat soluble and thermostable and occurs chiefly in the germ of wheat and oats, and to a less extent in yolk of egg.

milk, butter, fresh green leaves, fruit and meat. Absence of this vitamin causes sterility and its use is indicated in cases of habitual abortion.

It may finally be stated that a fairly generous and mixed diet consisting of milk, cheese, eggs, butter, vegetables with cereals and bread supplemented by oranges, grape fruit or tomatoes would be found sufficient to meet the requirement. Meat and liver are added to those accustomed to meat diet. The quantity of fluids and common salt should be strictly limited.

Exercise. A moderate amount of exercise is always beneficial to the pregnant woman. It is a great mistake to confine herself to the house, or to imagine that once pregnancy occurs she must give up all forms of exercise; at the same time heavy work, active and vigorous exercise such as will unduly tire her, should not be allowed. In addition to the ordinary household duties the pregnant women should be encouraged to indulge in walks in the open air. This she may do right through the whole course of pregnancy. Violent exercises, on the other hand, such as riding, skating, swimming and cycling should be discontinued because of the risk of causing abortion or miscarriage. Likewise, it is inadvisable to undertake long automobile journeys, especially on bad roads.

Clothing. The clothing that is worn by a pregnant woman should be light and not too tightly drawn around her body. High-heeled shoes, tight or close fitting garments of all nature such as corsets, or too light garments in the winter are to be avoided. In the early weeks the waistbands of the clothing do not matter much; but as pregnancy progresses it is better if the garments be made to hang from the shoulders, instead of being tightly tied round the waists. In some cases, where there is a tendency for the uterus to fall forwards, an obstetric belt may be worn to give proper support.

Care of the Teeth. This is very necessary. In the majority of cases there is some degree of pyorrhoea. Focal infections round about decayed teeth are likely to give rise to minor ailments, sometimes favouring puerperal sepsis. For this reason, proper cleaning of the teeth should always be insisted upon. In some cases deficiency in the diet, particularly in vitamins C and D, may be responsible for decay of the teeth and spongy and bleeding gums during pregnancy. In such cases the deficient vitamins should be supplied. Vitamin C is available in strongly acid foods such as lemons and oranges, and in green leafy vegetables like cabbage and lettuce. Milk also contains an ample amount of it when it is freshly drawn, but it is lost after boiling. Vitamin D is available in eggs.

Care of the Breasts. This is very important and should be attended to in the last weeks of pregnancy. When the breasts begin to enlarge, the clothing should be such that it does not cause undue pressure. If the breasts are big and heavy, some form of support should be provided by a properly fitting brassière. In the later weeks the nipples should be washed daily with soap and water and drawn out. Any cracks should be attended to.

Bowels. The bowels should be kept regular during the whole of pregnancy. They must move at least once a day, and every effort should be made to secure this by dietary regulations. It is not advisable to give cathartic purgatives, especially in the early weeks of pregnancy. If the bowels do not move, one or other of mineral oils may be tried and the diet suitably modified by an increase in the quantity of vegetables and fruits. In the later months it is perhaps well to see that the bowels are fairly well moved by a light purgative; half an ounce of castor oil, given every fortnight from the twenty-eighth week of pregnancy, is beneficial.

Bath. A daily bath is of great value preferably a warm one. Extremes of temperature, either hot or cold, should be avoided. It is not desirable, however, to use tub baths, in view of the risk of organisms entering the vagina. Shower-baths or the ordinary forms of bath used in the tropics can be safely continued throughout.

Sexual Intercourse. Sexual intercourse should not be permitted after the twenty-eighth week of pregnancy. The danger of infection is great, and many instances have been reported of puerperal sepsis occurring in women who had intercourse within the last few weeks of delivery. Excess of all sorts must be avoided. Where repeated abortions or premature deliveries have occurred it is better to avoid all marital relations during pregnancy.

Mental Hygiene. The prospective mother should maintain an equable temperament and should avoid all mental excitement. It is advisable to read some good literature, books which are not sensational, and to know something of what is expected of her as a mother. Maternal impressions go a long way to create the proper mental environment necessary to regard pregnancy and labour as physiological processes; while it is impossible in some cases to relieve the mother entirely of some mental anxiety, in the large majority of cases it is possible to assure her and to gain her confidence. We have noted sudden death after labour in women so hopelessly pessimistic that they expected the worst when labour started. Such a frame of mind is of graver prognostic significance than any of the serious complications of labour.

General Advice. The patient should be warned of particular symptoms which, when present, should immediately make her

consult her obstetrician. Bleeding from whatever cause, reduction in the quantity of urine, any swelling of the lower extremities, continuous headache, pain in the epigastrium, dimness of vision, cramps in the legs, painful contractions of the uterus from whatever cause, rupture of the bag of membranes irrespective of the period of pregnancy, should all make her report to the obstetrician for suitable advice. If everything is normal, the pregnant woman should attend the antenatal clinic at periodic intervals as mentioned earlier in this chapter. Any of the minor ailments of pregnancy, such as cramps in the leg, pelvic pain, varicose veins, hæmorrhoids, palpitation, increased vomiting, etc., should necessitate a consultation.

The pregnant mother should be told when she may expect labour to begin, and all arrangements should be made so that at the onset of labour she will have the assistance of a well-qualified midwife, and be in possession of the necessary outfit and armamentarium required for a delivery.

One word of caution must be given. Antenatal care is not an end in itself, but is a means to an end, namely, a safe delivery. Antenatal care will go far to ensure this; but something more is essential namely, efficient intranatal and postpartum care. Nothing that can be done by antenatal care will be of any avail if proper obstetric help is not available during labour. We hold to the belief that while antenatal care can be given efficiently by a large number of practitioners, cases do occur where it is desirable, because of possible difficulty at labour, that the expectant mother should be referred to a consultant antenatal clinic, manned by specialists. Where there is adequate antenatal supervision, skilled midwifery, proper attention to details at the bedside, vigilant postnatal care and hospitalisation where necessary, maternal mortality could be reduced to a quarter of the national average. It is also well to realise the limitations of antenatal care; certain conditions cannot be detected by any efficient method and in other cases complications may arise without previous warning. In the majority of cases antenatal care will certainly help the patient to go through pregnancy safely and to face labour with equanimity.

The care of the woman in labour will be discussed in the subsequent chapters.

SECTION III
PHYSIOLOGY OF LABOUR

CHAPTER X

CAUSATION AND STAGES OF LABOUR

Definition. Labour is the process by which the products of conception, when they have reached full term, or are nearing it, are separated from the uterus and expelled through the genital passages.

Labour may end spontaneously or may require external aid to complete it. When a full-term foetus presenting by the vertex is expelled by natural efforts unaided within a period of twenty-four hours, the term *normal* or *natural labour* is used to designate the condition. If the foetus had not attained maturity when it is expelled, we speak of *premature labour*. Spontaneous expulsion of the products of conception before the period of viability of the foetus is termed *abortion* or *miscarriage*.

Causes of Labour. What is it that brings about the uterine contractions which cause separation and expulsion of the products of conception when the foetus has reached term? So far, no particularly clear theory has been expounded which will answer this question. There are several factors which may have a bearing on it, and among the many theories advanced are . . .

- (1) Increased irritability of the uterine musculature
- (2) Dilatation of the cervix by the presenting part.
- (3) The periodicity of the menstrual epoch.
- (4) Certain changes occurring in the decidua during the latter half of pregnancy.
- (5) The circulation in the maternal blood of a foetal antigen causing an anaphylactic reaction.
- (6) The influence of certain hormones.
- (7) Heredity and habit.

It is futile to discuss these theories at length, and in all probability more than one factor is responsible for the causation of labour. The increasing knowledge of the part played by the endocrine hormones during pregnancy and parturition may possibly throw some light on the subject. Further investigations are required before any definite pronouncement can be made.

Stages of Labour. Three stages are generally recognised in the process of labour.

To these may be added what may be called the preparatory stage of labour, which may begin about two to three weeks before the onset of labour in a primigravida and a few days before in a multigravida. The phenomena of this preparatory stage consist of—

(1) The falling forward of the uterus with the head sinking into the pelvis, resulting in the so-called "lightening," due to the relief of pressure exerted by the gravid uterus upon the diaphragm and therefore on the lungs and heart.

(2) The gradual shortening of the cervix—a process that commences some days before the actual onset of labour in some instances.

(3) False or spurious labour pains which occur more frequently in primigravida than in multiparae. False pains are often caused by a temporary indigestion or by a loaded rectum. They are relieved either by a laxative or an enema. They are distinguished from true labour pains by their temporary character, irregularity and by the fact that they are felt generally over the abdomen, instead of in the lumbo-sacral region or just above the pubis. They do not progress and do not cause any dilatation of the cervical canal.

When true labour pains set in, the three stages referred to already will be noted. They are:—

- (1) The first stage—or the stage of dilatation.
- (2) The second stage—or the stage of expulsion.
- (3) The third stage—or the stage of placental delivery and uterine contraction and retraction.

FIRST STAGE

This extends from the onset of true labour pains to the complete dilatation or dilatability of the os when rupture of the membranes usually occurs. The duration of this stage is variable. On an average it extends in a primigravida to sixteen hours, while in a multigravida the average is from six to eight hours.

The phenomena during this stage of labour are:—

- (1) Uterine contractions, or true labour pains.
- (2) Muco-sanguinous discharge, or the "show."
- (3) Dilatation of the cervical canal, so that both the internal and the external os become completely dilated.
- (4) In normal cases fixation of the head at the brim of the pelvis and its progressive descent.
- (5) Rupture of the membranes.

(1) *Uterine contractions*, or true labour pains, occur at intervals of half an hour at the commencement of the first stage, but gradually they come on more frequently, till towards the end of the first

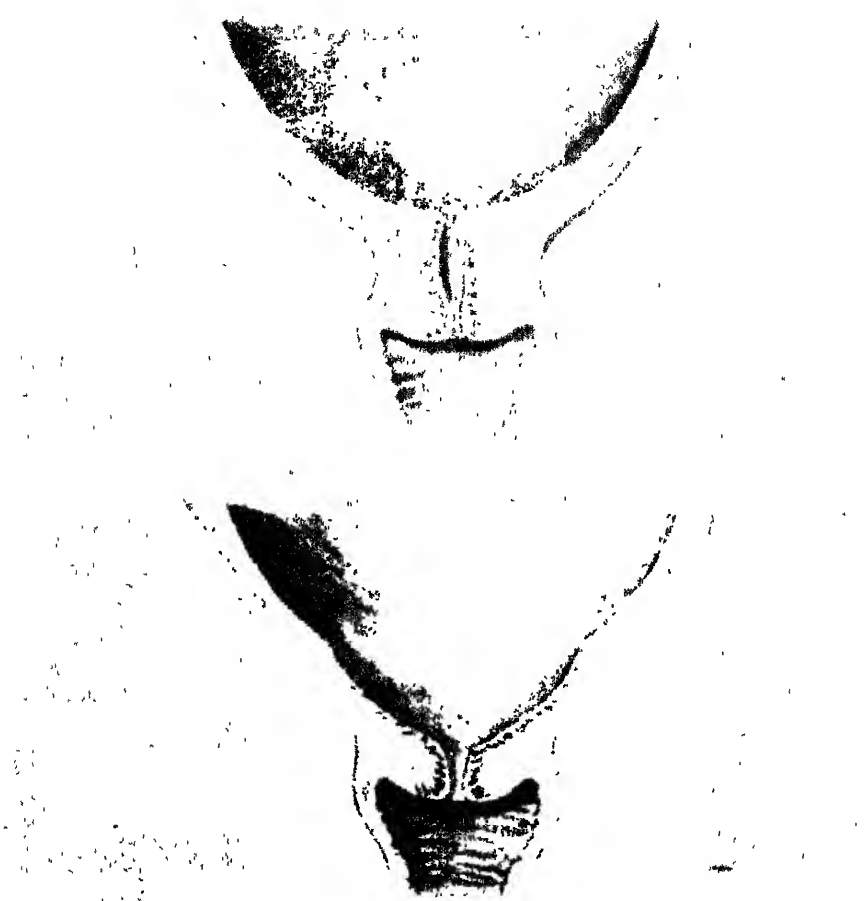


FIG. 33.—Stages of dilatation of the cervical canal in a primipara

stage they may occur every few minutes. At first the pains are felt in the region of the sacrum, but later they radiate to the lower abdomen, and sometimes down the legs. In some cases they may be associated with a feeling of nausea or actual vomiting, and urine may be passed frequently. The cervix becomes more soft and patulous, till at the end of this stage its rim becomes continuous with the walls of the vagina.

(2) *The muco-sanguinous discharge* is from both the cervix and vagina. The dilatation of the lower uterine segment and of the cervix that occurs in the first stage promotes separation of the

membranes from the wall of the uterus, giving rise to a slight hæmorrhage, while the mucous discharge is generally the operculum present at the cervical canal that gets loosened and discharged.

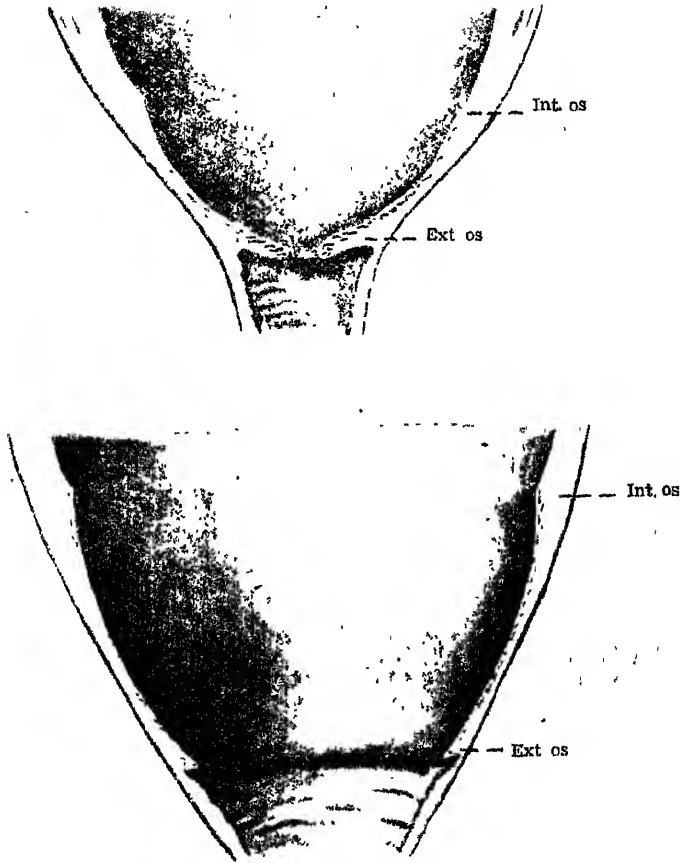


FIG. 34.—Further stages of dilatation of the cervical canal in a primipara.

This blood stained mucus is known as the "show," and is valuable corroboration that accompanying pains are true labour pains.

(3) *Dilatation of the Cervix.* As a result of these contractions the uterus, early in labour, becomes converted into an upper, thick-walled, contractile portion, and a lower, thin-walled passive segment. As labour proceeds the wall of the upper uterine segment, which contracts and retracts, becomes thicker and thicker, while the lower uterine segment, which is fairly well differentiated, expands and receives the body of the foetus, causing progressive thinning of its walls. With the dilatation of the lower

uterine segment, the cervical canal also proceeds to dilate. The process of dilatation is brought about by three factors:—

(i) The pressure of the bag of membranes exerted continually on the somewhat soft cervical canal.



FIG. 35.—Stages of dilatation of the cervical canal in a multigravida.

(ii) At the same time the uterine contractions help to push the cervical canal over the presenting part by the contraction of the longitudinal fibres.

(iii) The third factor is the pressure exerted by the presenting part, more particularly after rupture of membranes.

The process of cervical dilatation differs somewhat in a primipara from a multipara. At the commencement of labour

primipara, the whole of the cervical canal is closed, both the internal and external os being occluded. The dilatation therefore is progressively from above downwards, the internal os dilating first, then the cervical canal, and last of all the external os. In a multipara, on the other hand, at the commencement of labour, the external os is patulous, usually admitting freely one finger, sometimes more. The internal os, is not quite so completely occluded as in a primiparous cervix. The process of dilatation therefore is a little more rapid and easy, inasmuch as the dilatation of the internal os brings about a simultaneous dilatation of the whole cervical canal, the external os being already open.

(4) In the majority of cases *the head becomes fixed* at this stage, if it has not already done so in the last weeks of pregnancy. Non-fixation of the head in cephalic presentations suggests the possibility of abnormalities.

(5) *The membranes usually rupture* after full dilatation of the cervix, when the second stage commences.

SECOND STAGE

The second stage, or the stage of expulsion, extends from the complete dilatation and rupture of the membranes, to the expulsion of the foetus. This stage may last from two to three hours in a primipara, and from one to two hours in a multipara.

The phenomena of this stage consist in:—

- (1) The occurrence of the characteristic uterine contractions.
- (2) The coming into action of the accessory muscles of labour.
- (3) The progressive descent of the presenting part.
- (4) The dilatation of the vagina and vulva with stretching of the pelvic floor.
- (5) The expulsion of the foetus

Uterine Contractions. The nature of the uterine contractions gradually changes, getting stronger in the second stage; they are more severe than in the first stage and are of a "bearing-down" character. The voluntary muscles—the accessory muscles of labour—also begin to contract and exert their influence towards the end of the second stage. The diaphragm and the abdominal muscles begin to act and the patient clutches at anything she can hold of. With each of these pains the foetus is driven down through the dilated cervical canal and the vagina relaxes and opens to receive it. When the perineum is reached it is stretched so that it begins to bulge with every uterine contraction. The presenting part is now directed upwards and forwards, towards the opening of the vulva by the pelvic floor. Between the perineum and the

parts press back the foetus, till the presenting part is so firmly fastened under the symphysis pubis that it can no longer recede.

Lastly, there is the gaping of the vulva, when the presenting part is fixed under the symphysis pubis—the phenomenon known as “crowning of the head” in vertex presentations. At this stage the patient feels an inclination to micturate and defecate. This is due to the pressure of the presenting part on the bladder and rectum. Lastly the head passes through the external opening, with a series of almost continuous uterine contractions, helped by involuntary straining efforts on the part of the patient, due to the action of the accessory muscles of labour. As expulsion of the head takes place the patient utters a sharp cry or groan and thereafter the rest of the foetus is born.

THIRD STAGE

The third stage, or the stage of placental delivery, is very important, and should be carefully watched. This extends from the complete expulsion of the foetus to the complete expulsion of the placenta and membranes, and firm contraction and retraction of the uterus subsequently. The average duration of this stage, when spontaneously completed, may extend from half to one hour.

As soon as the birth of the foetus is over the woman feels relief and is calm and comfortable. Now and again there may be feeling of faintness, caused by the sudden evacuation of the uterus, especially after the delivery of a large-sized foetus, or when the uterine contents have been suddenly evacuated, as in a case of hydramnios or twins.

The phenomena of the third stage of labour are:—

- (1) The characteristic uterine contractions.
- (2) The separation of the placenta after the formation of a retroplacental hæmatoma.
- (3) The expulsion of the placenta
- (4) The control of the hæmorrhage.
- (5) The permanent contraction and retraction of the uterus.

Uterine Contractions. After the completion of the second stage the uterus will be found almost at the level of the umbilicus, and is firm, round and hard as a cricket ball. Rhythmic contractions will occur and the patient may sometimes feel the pains.

Placental Detachment. As the foetus is being delivered, separation of the placenta may take place. The shrinkage of the placental site and the forcing downward of the whole placental

mass by the uterine contractions may cause the separation. There are two methods by which placental expulsion may occur—

(1) On account of the contractions of the uterus, the placenta may be folded on itself, so that the long axis of the placenta corresponds to the long axis of the uterus and the margin that

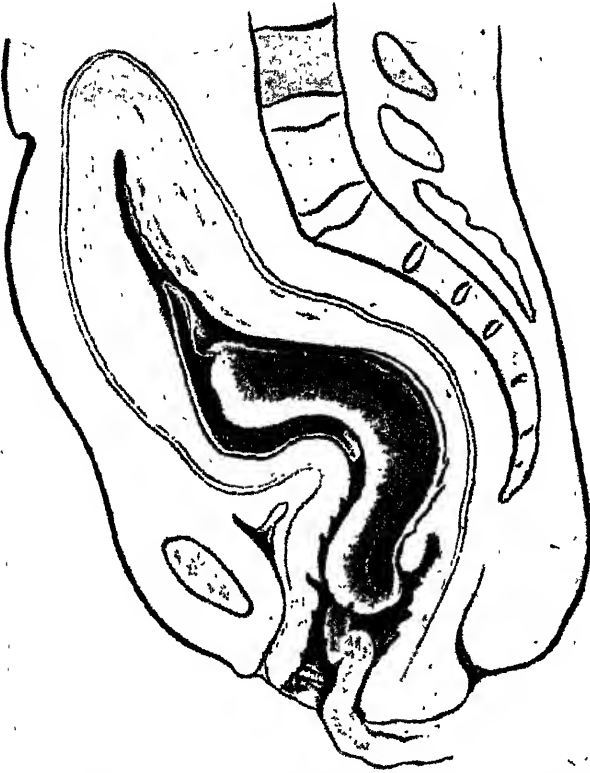


FIG. 36.—Mechanism of the expulsion of placenta—Duncan's.

presents at the cervix or vagina is the lower margin, showing perhaps a little of the foetal surface.

(2) The second method is the one where the placenta may separate at its centre. A retroplacental hæmatoma is formed which, with each contraction of the uterus, forces more of the placenta to separate, and the placenta thus separated presents itself at the vaginal outlet, with the centre of its foetal surface with the attached cord, like an inverted umbrella.

It is of little significance which method of expulsion is responsible for its final delivery.

The expulsion of the placenta usually occurs within half to one hour after the birth of the foetus. During this period the

uterus should be moderately hard, as the result of tonicity, so that when the placenta separates the contractions and retractions of the uterus will arrest hæmorrhage by closure of the placental

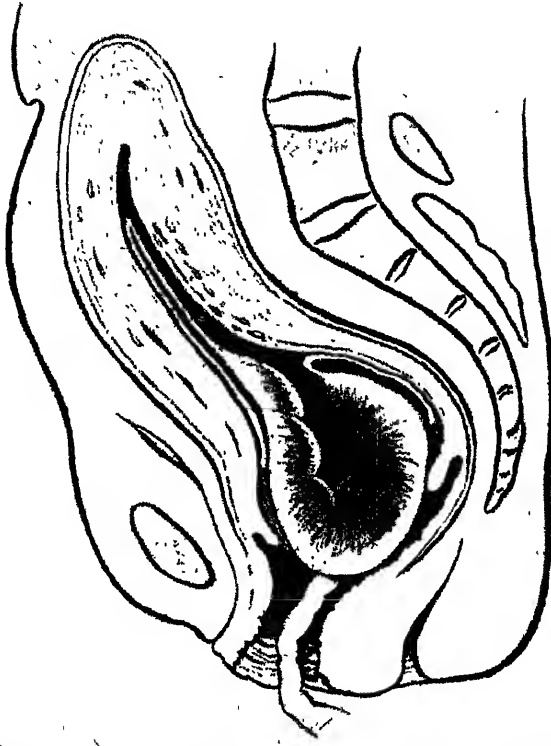


FIG. 37.—Mechanism of the expulsion of placenta—Schultze's.

sinuses. The control of hæmorrhage after separation of the placenta is due to three factors:—

- (1) The contraction and retraction of the uterus, constricting the vessels passing through the uterine wall to the placental site.
- (2) The occlusion of the torn vessels themselves.
- (3) The formation of blood-clots which favour the closure of the lumen of the vessels.

During the third stage there is always a moderate amount of bleeding; In a normal case it does not exceed about 600 c.c.

When the labour is over the patient may occasionally have a shivering fit, which is purely a vasomotor phenomenon and is not indicative of infection, and is generally of no particular significance. It is termed the "physiological chill."

CHAPTER XI

THE MECHANISM OF LABOUR

By this term is meant the manner by which the foetus adjusts itself to and passes through the parturient canal with the minimum amount of difficulty.

The three factors concerned in labour are: the passages, the passenger and the forces. The effect of each one of these and the pathological variations that may occur in any of them, are material factors to be taken note of in the mechanism of labour. Contractions of the pelvis and abnormalities of the soft parts may be responsible for variations in the mechanism of labour. So also with the passenger; the position, presentation and variations in the degree of flexion—not to speak of the size of the presenting part and other abnormalities associated with it—are factors that influence and change the mechanism of labour. Lastly, the forces by which we mean the uterine contractions, may also cause abnormalities of mechanism.

MECHANISM OF LABOUR IN A VERTEX PRESENTATION

We shall deal with the mechanism of labour in a vertex presentation, with the head in the first position, left occipito-anterior, with a normally sized pelvis and with a foetus that is also average in size and weight.

Certain terms are used in connection with the mechanism which it would be well to explain at this stage.

(1) **Engagement or Fixation of the Presenting Part.** By this is meant that the presenting part enters the superior strait of the pelvis. In cases of vertex presentations the head generally engages about two to three weeks before the onset of labour in a primipara, and two to three days before the onset in a multipara. Sometimes this may not occur until after the commencement of labour both in primiparae and multiparae. An important point to remember is that failure of engagement may denote an abnormality—a relative disproportion between the presenting part and the pelvis. A clear realisation of the extent of the disproportion and the causes which have favoured the non-engagement of the presenting part will be of material assistance in evaluating the possibilities of normal delivery.

(2) **Flexion.** This is the term used to denote the fact that the head is bent so that the chin is resting on the chest. Flexion may vary in its degree. Usually, at the commencement of labour, there is a tendency for increased flexion, so that the head is bent well forward. In some cases there may be a deficiency in this attitude of flexion. The result of this is that the head tries to engage with a diameter which is not the shortest, and consequently considerable difficulty may be experienced in the progress of the head. In other cases again, where increased resistance is met by the presenting part, there may be an increase in flexion. This occurs in cases of generally contracted pelves and brings the occiput to present instead of the vertex. With a normal degree of flexion the diameter of engagement in a vertex presentation is the suboccipito-bregmatic, measuring $3\frac{3}{4}$ ins.



FIG. 38.—Moulding and caput in a vertex presentation.

(3) **Moulding.** This is the term applied to the changes that take place in the foetal head because of the pressure exerted upon it in its passage through the pelvic canal. The foetal head differs from the adult head, in that there are a number of bones which are united by membranous sutures and fontanelles. This permits of a certain amount of overlapping of the bones of the vault of the skull, so that the parietal bones overlap each other, and the frontal and occipital bones pass underneath the parietal bones. This overlapping of the bones tends to diminish the diameters of the foetal skull in its passage through the birth canal and this process of adaptation of the foetal head by means of overlapping of the bones is known as moulding. This is a factor of much value in facilitating the descent of the head, and it will

be noted that in those cases where such overlapping or moulding cannot take place, as in cases of post-mature foetus, the resistance offered to the passage of the foetal head is much greater.

Let us next consider the various stages in the mechanism of labour in a vertex presentation. They are :—

- (1) Descent with engagement of the head and increased flexion.
- (2) Internal rotation.
- (3) Extension, resulting in the birth of the head.
- (4) Restitution, or the untwisting of the neck.
- (5) External rotation of the head, accompanied with internal rotation of the shoulders.
- (6) Delivery of the shoulders.
- (7) Expulsion of the rest of the body.

Descent is a constant phenomenon associated with every one of these movements and, as a matter of fact, without descent very few of the movements can take place.

(1) **Descent with Increased Flexion and Engagement of the Head.** In normal cases the head engages in what is known as a *synclitic* manner; in other words, the sagittal suture of the head lies in one or other of the oblique diameters of the pelvic brim, so that the parietal bones on either side are at the same level. Where abnormalities of mechanism occur, the sagittal suture may be pushed towards the symphysis pubis or the sacral promontory. Under such circumstances, *asynclitism* is said to occur. When the sagittal suture is diverted towards the sacral promontory, and the anterior parietal bone is leading, the condition is known as *anterior asynclitism*, or *Naegeli's obliquity*. Where the sagittal suture is closer to the symphysis pubis and the posterior parietal bone leads, it is known as *posterior asynclitism* or *Litzmann's obliquity*. The mechanism under such circumstances is dealt with later.

As the head continues to descend moulding takes place, and as the head passes through the pelvic cavity the portion of the presenting part which is in contact with the pelvis is subjected to pressure, and within this girdle a boggy, oedematous swelling of the soft tissues overlying the cranial bones results. This swelling is known as a *caput succedaneum* and is located upon the most dependent portion of the head, usually over the parietal bones, sometimes over the occipital bone. The swelling is due to infiltration of the subcutaneous connective tissue with a sero-sanguinous transudate. The position of the caput depends upon the position and presentation of the foetus during labour, and it can therefore be a method of determining, after birth, the position of the foetus *in utero*.

This movement of descent is brought about by two factors, namely, the "general contents pressure" of the uterus before rupture of the membranes, and the "foetal axis pressure" which comes into effect after the rupture of the membranes.

(2) **Internal Rotation.** The head engages in one or other of the oblique diameters of the pelvic brim, and once it has entered the cavity the next movement takes place—internal rotation. This helps to bring the diameter of engagement of the foetal head to the longest diameter of the pelvic cavity available for the passage of the head. It has been pointed out that the longest

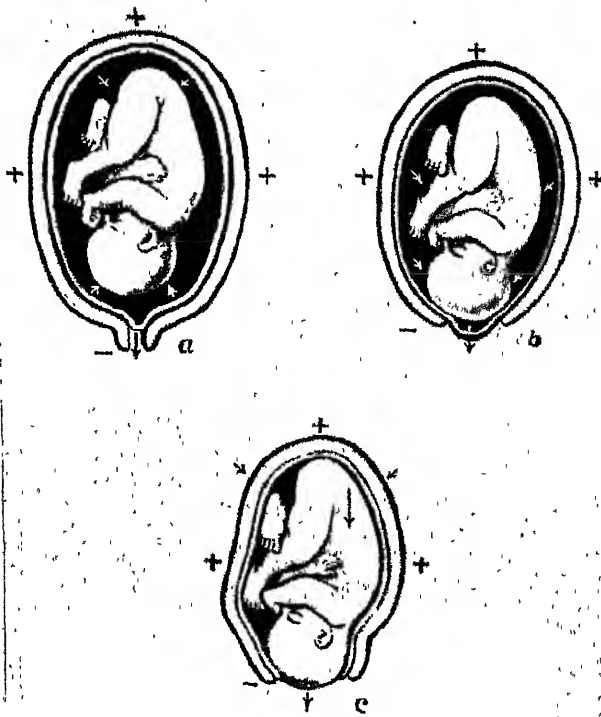


FIG. 39:

- a. General fluid pressure. b. Cervical canal; the least resistant area is seen yielding.
c. Foetal axis pressure after rupture of membranes.

diameter of the pelvis varies at different levels; at the brim the longest diameter is the oblique diameter, whereas at the outlet the antero-posterior diameter is the longest. With a view to adapting itself to the varying diameters of the pelvis, the head changes its position by rotating the leading part forwards, and this movement is known as internal rotation. In the first position

of the vertex the movement occurs through one-eighth of a circle, bringing the occiput to lie underneath the symphysis pubis.

Internal rotation is brought about by the following factors:—

- (i) The shape of the pelvis: the forward incline of the walls of the pelvic cavity helps to rotate forwards the most dependent part of the presenting pole.
- (ii) The tendency to forward rotation is helped by the contour of the musculo-fascial slings forming the pelvic floor.
- (iii) The impetus given by the spine of the ischium is another dominant causative factor in this phenomenon.
- (iv) The effective contractions of the uterus are essential to promote internal rotation.

In those cases where deficient flexion fails to cause the occiput to be the most dependent part, rotation of the occiput forwards

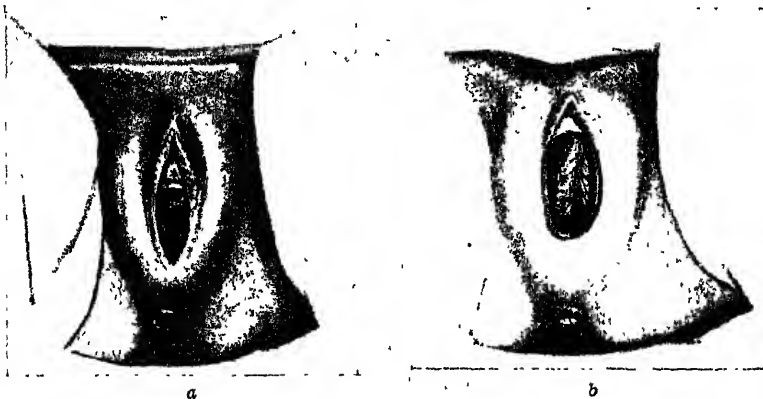


FIG. 40.—Second stage: the head stretching the perineum.

may not occur. Also, where there is a deficiency of the pelvic floor from previous lacerations, rotation may be rendered difficult or delayed. Lack of uterine contractions, or weak pains, may prevent the completion of internal rotation; hence prolongation of the second stage of labour may occur, necessitating artificial aid.

(3) **Extension and Birth of the Foetal Head.** When internal rotation is completed the occiput comes to lie underneath the symphysis pubis, and the head is in an attitude of flexion. Subsequent uterine contractions favour the next movement so essential for the birth of the head, namely, extension. Extension is the resultant of two forces, the effect of the uterine contractions from above and the elastic resistance of the pelvic floor from below. As a result of extension the occiput hitches against the symphysis pubis, the face sweeps over the perineum, and the successive parts of the foetal head to be born are the sinciput, the orbital ridges,

nose, mouth and chin. At this stage the perineum is stretched, and if proper support is not available, or if the head descends too rapidly in the process of extension, the perineum may be torn—the degree of the tear depending upon the force with which the head comes down, the rapidity with which the perineum is stretched and the particular diameter of the head that stretches the perineum.

An abnormal mechanism may show up for the first time at this stage, as in occipito-posterior positions, where internal rotation has resulted in the occiput lying in the sacral hollow, the head being delivered with face to pubis.

(4) **Restitution.** As soon as the head is free outside the vulval outlet it rotates through one-eighth of a circle, and thus the neck is untwisted and the chin rotates towards the right side in

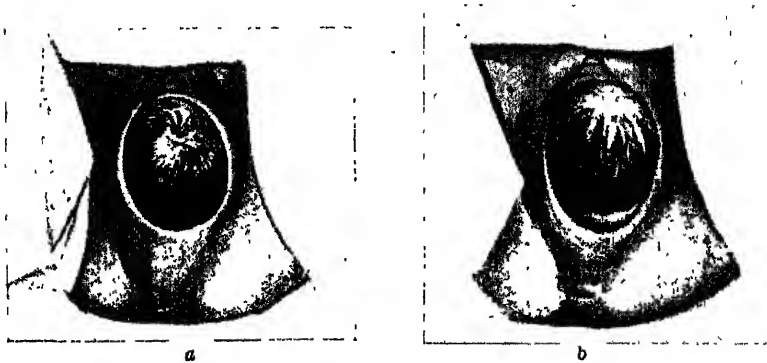


FIG. 41.—Delivery of the head.

(a) Crowning.

(b) Head emerging at the outlet.

Note the stretching of the perineum.

cases of left occipito-anterior positions and towards the left in cases of right occipito-anterior positions.

(5) **External Rotation.** After the untwisting of the neck has occurred, the next movement is one of internal rotation of the shoulders, bringing the bisacromial diameter into the antero-posterior diameter of the pelvic outlet. The anterior shoulder is now underneath the symphysis pubis. External rotation of the head occurs simultaneously with this movement. In the left positions of the occiput the head turns further towards the mother's right, until the face points directly to the right thigh; and in the right positions of the occiput the head turns in the reverse direction.

Restitution and external rotation frequently occur in such quick succession that they may practically appear to be one

continuous movement; but if a careful observation be made it will be found that restitution occurs first, and after a short interval external rotation takes place.

Once the shoulders have rotated into the antero-posterior diameter of the outlet, descent continues with the uterine contractions, until the anterior shoulder hitches underneath the symphysis pubis and the posterior shoulder sweeps over the perineum by a

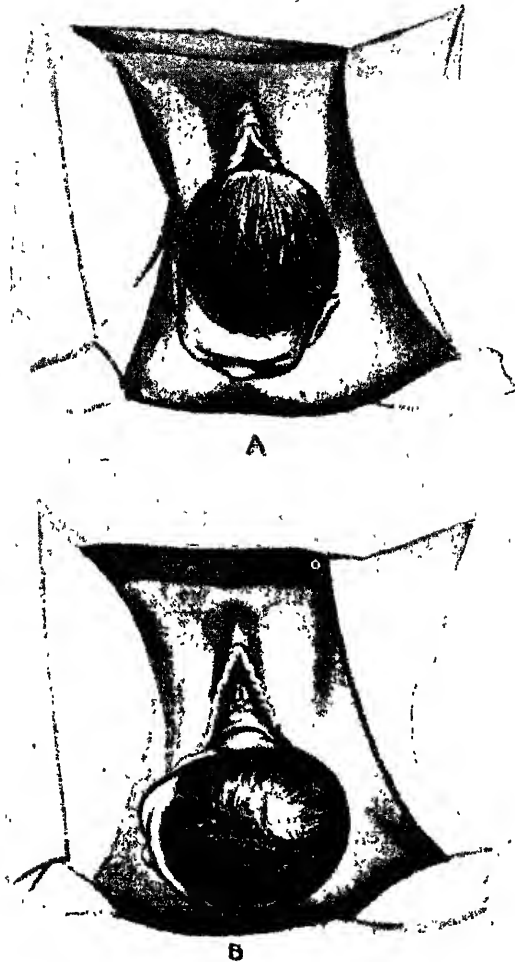


FIG. 42.—Delivery of the head.

A. Extension completed.
B. External rotation.

process of latero-flexion of the spine and is delivered first, followed a little later by the slipping forward of the anterior shoulder from underneath the symphysis pubis. After the expulsion of the

shoulders the foetal body slips down through the pelvic cavity and the rest of the body is thus delivered.

THIRD STAGE

During this stage the placenta and membranes become separated from the uterine wall and are then extruded through the vaginal outlet. For some time after the birth of the child the placenta remains firmly fixed *in situ* to the uterine wall. Later, by one of two methods of separation already described, the placenta gradually separates, and with it the membranes peel off and the whole is expelled through the vaginal outlet. With the separation of the placenta, and sometimes with its extrusion, a certain amount of bleeding occurs, associated with slight pains. Once the placenta has been expelled, the uterus contracts and retracts till it becomes as hard as a cricket ball, and bleeding completely stops.

CHAPTER XII

CONDUCT OF NORMAL LABOUR

It is important to realise that labour is a physiological process, and that in the majority of cases nature completes the delivery without any artificial aid. The attitude of the obstetrician has been described as "one of masterly inactivity and watchful expectancy." Nowhere is there greater need than in obstetrics to desist from the temptation of interfering too frequently or prematurely, and the success of the obstetrician is in inverse proportion to the number of cases where he has actively interfered. "Meddlesome midwifery" is responsible for a great deal of maternal morbidity and a fair proportion of maternal mortality than any other factor; and in the stress of modern life, with its preoccupations, there is the danger that the obstetrician may be inclined to interfere with nature and complete the process of labour, either because of the time natural delivery is to take or because of insistent demands by the patient or her friends. Looked at from the larger point of view, and particularly with regard to the future life history of the patient, it must be conceded that the maximum amount of safety, both at the time of confinement and later, lies in the minimum amount of interference. One must resolutely desist from the temptation to interfere artificially, simply because of prolongation of the stages of labour, or because of the feeling that it is better to terminate the agony of the patient earlier. Though it is desirable to allow nature to complete the process of

delivery, one should not wait too long lest some permanent damage should occur either to the foetus or to the mother from lack of timely assistance.

PROPHYLACTIC CARE

The conduct of normal labour does not begin when the woman starts in labour. It is far more important to look after the health of the mother long before, and to attend to any complications during pregnancy. In this way it is possible to have a clear realisation of the nature of the delivery that is likely to ensue. Nothing is more likely to cause sudden and disastrous consequences during labour than the recognition too late of factors having an adverse influence upon its course. It is the duty of the obstetrician to see that in the conduct of labour he meets with no surprises. Efficient antenatal care, in its wider sense, is the best way to prevent the tragedies of abnormal labour.

GENERAL PREPARATION

The following points have to be borne in mind in the preparation of the patient for delivery:—

- (1) The surroundings in which the delivery should be conducted.
- (2) The obstetric outfit.
- (3) The preparation of the lying-in room and the labour-bed; mother's and baby's outfit; the articles to be kept ready at the time of labour.

(1) **The Surroundings.** It is desirable that the patient should be delivered in such surroundings that there will not be any risk of sepsis. For this purpose, ill-ventilated, crowded rooms, with imperfect drainage and sewerage, are not desirable. In the majority of cases where such surroundings are inevitable, it is far better for the patient to be removed to an institution as soon as the pains start. Where complications are met with during the course of labour, the obstetrician should carefully consider whether it is safe for labour to be conducted in such surroundings. It is certainly unsafe for cases of toxæmia of pregnancy, antepartum hæmorrhage, difficult operative deliveries, etc., to be undertaken where efficient help is not available, and the surroundings themselves are far from satisfactory. It is becoming increasingly recognised that for the majority of the serious complications of labour, a maternity institution is much more favourable for a safe delivery than the patient's own house, and it should be the duty of the obstetrician to emphasise this to the patient and her relatives.

shoulders the foetal body slips down through the perineum and the rest of the body is thus delivered.

THIRD STAGE

During this stage the placenta and membranes break away from the uterine wall and are then extruded through the vaginal outlet. For some time after the birth of the child the placenta remains firmly fixed *in situ* to the uterine wall. In the two methods of separation already described, the placenta usually separates, and with it the membranes peel off and are expelled through the vaginal outlet. With the separation of the placenta, and sometimes with its extrusion, a little of bleeding occurs, associated with slight pains. Once the placenta has been expelled, the uterus contracts and retracts as hard as a cricket ball, and bleeding completely

CHAPTER XII

CONDUCT OF NORMAL LABOUR

It is important to realise that labour is a physical process and that in the majority of cases nature completes it without any artificial aid. The attitude of the obstetrician has been described as "one of masterly inactivity and expectancy." Nowhere is there greater need than in labour to desist from the temptation of interfering too frequently, and the success of the obstetrician is in inverse proportion to the number of cases where he has actively interfered. Some "midwifery" is responsible for a great deal of maternal morbidity and a fair proportion of maternal mortality; and in the stress of modern life and its preoccupations, there is the danger that the obstetrician may be inclined to interfere with nature and complete labour, either because of the time natural delivery takes, because of insistent demands by the patient or her relatives, or from the larger point of view, and particularly from the future life history of the patient, it must be considered that the maximum amount of safety, both at the time of delivery and later, lies in the minimum amount of interference. The obstetrician must resolutely desist from the temptation to interfere and to prolong the stages of labour, or to terminate the agony of the patient, or to feel that it is better to terminate the agony of the patient. Though it is desirable to allow nature to complete

delivery, one should not wait too long lest some permanent damage should occur either to the foetus or to the mother from lack of timely assistance.

PROPHYLACTIC CARE

The conduct of normal labour does not begin when the woman starts in labour. It is far more important to look after the health of the mother long before, and to attend to any complications during pregnancy. In this way it is possible to have a clear realisation of the nature of the delivery that is likely to ensue. Nothing is more likely to cause sudden and disastrous consequences during labour than the recognition too late of factors having an adverse influence upon its course. It is the duty of the obstetrician to see that in the conduct of labour he meets with no surprises. Efficient antenatal care, in its wider sense, is the best way to prevent the tragedies of abnormal labour.

GENERAL PREPARATION

The following points have to be borne in mind in the preparation of the patient for delivery:—

- (1) The surroundings in which the delivery should be conducted.
- (2) The obstetric outfit.
- (3) The preparation of the lying-in room and the labour-bed; mother's and baby's outfit; the articles to be kept ready at the time of labour.

(1) **The Surroundings.** It is desirable that the patient should be delivered in such surroundings that there will not be any risk of sepsis. For this purpose, ill-ventilated, crowded rooms, with imperfect drainage and sewerage, are not desirable. In the majority of cases where such surroundings are inevitable, it is far better for the patient to be removed to an institution as soon as the pains start. Where complications are met with during the course of labour, the obstetrician should carefully consider whether it is safe for labour to be conducted in such surroundings. It is certainly unsafe for cases of toxæmia of pregnancy, antepartum hæmorrhage, difficult operative deliveries, etc., to be undertaken where efficient help is not available, and the surroundings themselves are far from satisfactory. It is becoming increasingly recognised that for the majority of the serious complications of labour, a maternity institution is much more favourable for a safe delivery than the patient's own house, and it should be the duty of the obstetrician to emphasise this to the patient and her relatives.

(2) **The Obstetric Outfit.** The obstetrician directions to the patient or the nurse in charge be got ready by her and what he will provide. tions to accommodate the varying economic cir patient concerned, certain essentials should alwa The following things must be kept in readines house: a douche can, rubber sheeting, sterilised wool, abdominal binders, soap, nail- brush, surgic for the vulva after delivery, cotton-wool pledg eyes, antiseptics, basins, boric acid, small and la chloroform (4 to 6 oz.).

The obstetrician's bag should contain the nec for delivery of a patient, the drugs necessary partum hæmorrhage, and appliances used in asphyxia neonatorum. It is wise also to incl required to treat collapse, should postpartum h vene. The modern obstetric bag on the market and the physician will do well to supplement special drugs, instruments, or appliances he may

(3) **The Lying-in Room and Labour-bed.** in a private house should not have been used b, from infectious diseases, and it should be o ventilated and dry. Care should be taken efficiently drained, thoroughly cleaned, and the pieces of furniture and drapery are removed furnishings in the lying-in room the better. In desirable that this room is, away from the r prevent the entry of dust.

The labour-bed should not be too low and s as possible and perfectly clean. A mattress be with rubber sheeting covering the whole length the middle third, and projecting on either side, sheet spread over it, is desirable. Over the k rubber sheet to cover the lower half of the bed The bed should be so situated that it is easily obstetrician and the nurse from either side.

In the labour room, arrangements should be r supply of hot water, a clean bowl for receiving clean enamel bowls with lotion for cleansing t with sterilised pledgets of cotton-wool soaked cup or tumbler with boric acid solution and s pledgets for wiping the baby's eyes, an abunda clean sheets and towels, a large basin or ba resuscitation of the baby if necessary, small piec to wipe the mouth, a bowl containing a steril

and sterile ligature for the cord, and a basin or clean bucket for receiving the soiled cotton-wool and linen. There should also be available sterilised overalls, gloves, masks, etc., for the obstetrician and nurse.

MANAGEMENT OF LABOUR

The obstetrician engaged for a confinement should respond as promptly as possible when a call comes, since there are several complications that can easily be remedied at an early stage in labour, but, if left untreated, lead to dangerous consequences. In cases of malpresentations, malpositions, prolapse of the cord, hydramnios, toxæmic conditions, etc., the earlier the patient is attended to, the more successful will be the outcome for mother and child.

For this purpose we would emphasise the necessity in hospitals of encouraging the practice of "booking," so that no patient is admitted into the intern department of a maternity institution who has not already been "booked." A booked case is one who has been regularly attending the antenatal clinic of the hospital and has had antenatal supervision and advice. It is desirable, if maternal morbidity and mortality are to be reduced to a minimum, that institutions should insist upon this.

Another advantage is that the obstetrician called on to conduct the labour, by perusing the antenatal record of the patient, is in a position to decide what particular mode of delivery is to be expected.

PREPARATION OF THE PATIENT

The pubic hair should be shaved and the parts cleansed with soap and water. Whenever possible it is wise to give the patient a bath. There has been some controversy over this point due to the fact that the common type of bath in the West is the tub bath, where the patient sits in the water, which is contaminated by her own sweat, etc., and it is just possible that some of the dirt may find its way into the vaginal passage. But in the ordinary type of bath given in the tropics, where there is no bath-tub used, but water is poured over the patient's body and finds its way out through a drain, there can be no possible objection to such a bath being given to the woman in labour, and as a matter of fact it is desirable that it should be given.

Before the bath it is preferable to give the patient a large soap and water enema. One of the conditions which may impede the progress of labour is a loaded rectum, and in every case where the patient complains of labour pains it is desirable that the enema be given as early as possible. Another advantage of giving such an

enema is that in cases where the patient is having false pains they may pass off. If they are true labour pains, they will increase in severity after the bowels have been emptied. Where, however, the patient is advanced in labour, and the head is low, it is not desirable to give an enema. Where the patient has to be delivered immediately by operative measures an enema should be strictly forbidden. In such cases, if an enema is given, the chances are that with some amount of pressure the enema water may go in, but will not be expelled till the time of delivery, when a spray of fluid out of the rectum will contaminate the surrounding area and be a fruitful source of septic infection.

OBSTETRIC EXAMINATION

After an enema has been given and the patient has had a bath and has been prepared, she should be made to lie on a couch and a careful examination made. This consists of inspection, palpation, auscultation and, where absolutely necessary, a vaginal examination. The period of pregnancy should be estimated from the height of the uterus; the position and presentation of the foetus made out by palpation; the position and rate of the foetal heart ascertained by auscultation; any anomalies with reference either to the foetus or the mother should be noted, and only in those cases where any doubt is felt or the stage of labour cannot be definitely ascertained, or the history of the patient does not agree with the clinical findings, or where there is any complication such as hæmorrhage, need a vaginal examination be made.

VAGINAL EXAMINATION

Strict antiseptic precautions should be taken before an internal examination is made. No matter how carefully done there is always an attendant risk in such examination, and it is extremely desirable that the obstetrician should desist from making such an examination, unless there is a clear indication.

Where an examination is decided upon, the external genitalia should be carefully washed again and the parts painted with a 2 per cent. aqueous solution of iodine and the area draped with sterile towels exposing only the vulva. The obstetrician should have cleansed his hands thoroughly, soaked them in antiseptic lotion and put on sterile overall, mask and gloves.

With the patient in the dorsal position the obstetrician separates the labia minora by two fingers of one hand swabs the introitus vagina with sterile pledgets of cotton wool from above downwards and then introduces two fingers of the other hand directly into the

vaginal canal. Care must be taken to see that the fingers do not rub against the perineum or come in contact with any portion of the anus.

When a vaginal examination is made, all the necessary information should be ascertained. The practice of frequent vaginal examinations with a view to find out one or other of the several factors to be observed is to be strongly deprecated. When a vaginal examination is made early in labour, the following points should be determined:—

- (1) The condition of the vulva, the vagina; the extent to which they are dilatable and the presence of any lubricating secretions.
- (2) The condition of the bladder and rectum.
- (3) The condition of the cervix—whether the cervix is soft and dilatable and whether the cervical canal is dilated and if so to what extent.

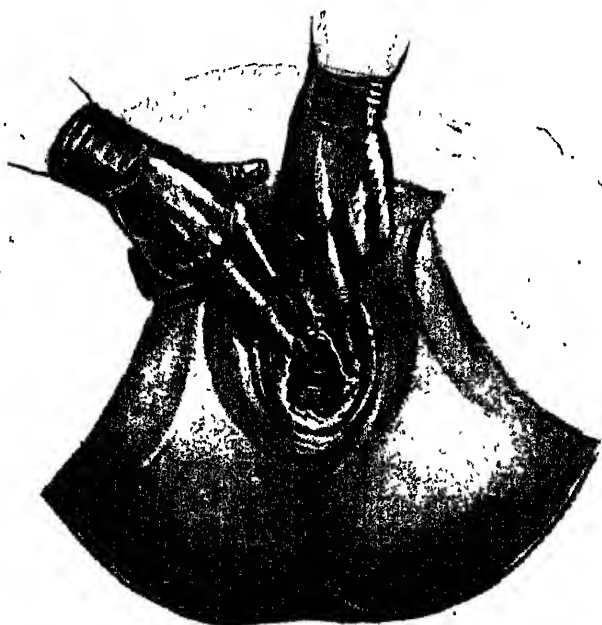


FIG. 43.—Method of making a vaginal examination.

Note the direction in which two fingers are introduced into the vagina.

- (4) Whether the membranes are entire or ruptured. If entire, the nature of the bag and whether it is round or cone shaped.
- (5) The presenting part—whether it is the head or any other part of the foetus, and details concerning the presenting

part. In cephalic presentations the position of the fontanelles should be ascertained with reference to the maternal pelvis.

- (6) The presence of a caput and the degree of moulding in cephalic presentations.
- (7) The exact position of the presenting part with reference to the maternal pelvis—whether the head is at the brim, in the cavity, or at the outlet.
- (8) Whether in cases of cephalic presentation the occiput has rotated, and if so, to what extent.
- (9) Whether the sacral promontory can be palpated or not.
- (10) The nature of the pelvic cavity, and any abnormalities in the soft parts such as cicatrices or in the bony passages such as narrow subpubic angle, prominent ischial spine or shallow sacro-sciatic notch.
- (11) The presence of abnormalities, such as a prolapsed cord, prolapsed limb or placenta prævia.

It is impossible to enumerate all the conditions that one may meet with, but it should be clearly understood that where an internal examination is made, it should be as thorough as possible, and should determine all abnormalities in regard to the passages and the passenger.

Should a Vaginal Examination be made? Ordinarily, there should be no need for a vaginal examination in a normal case. It is unnecessary to make a vaginal examination, as is sometimes recommended, soon after the membranes have ruptured. The only condition which is likely to be missed is a prolapsed cord, but this is most unlikely to occur if the head is fixed, which fact should have already been ascertained. It is also unnecessary to make repeated vaginal examinations to determine from time to time the manner in which the head is descending. The proper method of following the progress of the head is by the second pelvic grip or by perineal palpation. From due consideration of the other methods of examination available, and a proper appreciation of the facts revealed therefrom, it will be found that the need for a vaginal examination becomes much less. In many instances it is possible to conduct a normal labour without any internal examination at all, since the chief information gained through the vagina is the stage of dilatation of the cervix and it is often not specially important to know this.

In cases of prolonged labour, or where there is evidence of maternal or foetal distress, or where a case is seen for the first time in the second stage of labour, or where a definite history is not available, or where abnormalities arise during the course of labour, it may be necessary to make a vaginal examination either

to ascertain the exact nature and degree of the abnormality or as a preliminary to operative interference.

PELVIMETRY

If the patient has not been a booked case the importance of ascertaining pelvic measurements at this stage need not be emphasised. Pelvimetry should be done as a matter of routine in all primiparæ and the following pelvic measurements should be taken, namely, the intercrystal, the interspinous, the external conjugate and the antero-posterior and transverse diameters of the outlet. If there is any suspicion of pelvic deformity other measurements may also be necessary. In such cases internal pelvic measurements may have to be taken with a view to ascertain the exact nature and degree of the contraction.

If the patient is a multipara, pelvic measurements may not be necessary, provided the patient gives a history of having been delivered of a full-term live child and the child continued to live. In cases where a history is given of still-births or difficult operative deliveries, or the child died in the neonatal period, it is very desirable to take the pelvic measurements. In some cases, where abnormalities might have arisen in between two pregnancies consequent upon certain diseased conditions or accidents, such as the development of osteomalacia or the occurrence of fracture of the pelvis, it is obvious that pelvic measurements are necessary.

MANAGEMENT OF THE FIRST STAGE

Having done all the preliminary examination, the obstetrician should now be in a position to know whether the patient is having true pains or not. The signs and symptoms of labour are:—

- (1) The occurrence of labour pains simultaneously with contractions of the uterus; the pains are generally felt in the back and transmitted towards the front and lower part of the abdomen.
- (2) The occurrence of the "show." This is a discharge of mucus, often mixed with blood due to the separation of the mucous plug filling the cervix, the blood coming from the surface left bare by the separation of the membrane.
- (3) The presenting part is now fixed in a multipara.
- (4) An internal examination reveals that the cervical canal is dilating.

In the absence of any evidence of dystocia due to maternal or foetal causes, the attitude of the obstetrician should be one of

watchful expectancy. The patient should be allowed in the first stage, as it materially assists in dilating the cervix and fixing the head. During the first stage it is not necessary for the obstetrician to stay by the bedside except in a multipara, and in a primipara where the contractions are frequent and occur at frequent intervals; but as soon as the membranes are about to rupture he ought to be within easy reach.

During the first stage the patient should be encouraged to take small quantities of liquid nourishment at intervals, milk, broth, soup, fruit juice, etc. It is better to give solid food, because if the patient is given an anæsthetic she may cause nausea and vomiting. Towards the end of the first stage when the pains recur at short intervals the patient should lie on her dorsal or left lateral position. If labour starts at night, it is better to give a mild hypnotic so as to avoid a sleepless night. When uterine contractions increase in severity, the membranes usually rupture spontaneously when the cervix is fully dilated.

When should the Membranes be Ruptured

In normal cases there is no necessity for rupturing the membranes artificially, but conditions may arise when it is desirable. Such conditions are:—

- (1) When the cervix is fully dilated and the membranes remain entire owing to tough membranes.
- (2) Where the bag of membranes is actually protruding from the outlet there is no object in allowing it to rupture if the head is already fixed.
- (3) In some cases of antepartum hæmorrhage, rupture of the membranes controls bleeding.
- (4) As a method of induction of labour.
- (5) As a preliminary to operative delivery.

MANAGEMENT OF THE SECOND STAGE

This stage begins with full dilatation of the os and rupture of the membranes, and ends with the complete expulsion of the foetus. During this stage the patient should be placed in the left lateral position.

Care must be taken to see that the bladder is empty. The patient is encouraged to pass urine failing which she should be catheterised. It is not desirable to give an enema during this stage for reasons already mentioned.

Towards the end of the second stage when the head of the foetus is approaching, the patient is placed either on her left lateral position, and the patient should be encouraged to "bear down" during the pains; she should be instructed to hold her breath and bear down as a contraction reaches its height.

The foetal heart should be taken every fifteen minutes after the rupture of the membranes. The time when the membranes rupture should be carefully noted and the duration of the second stage should not be allowed to be unnecessarily prolonged without carefully re-examining the patient and ascertaining any abnormal factors that may be responsible for the delay.

In normal labour this stage does not exceed two to three hours. The pains become more frequent, they last much longer, and towards the end of the second stage the "bearing-down" pains commence; at this time the head presses against the perineum and the anus begins to dilate. It is now that the obstetrician should give the necessary assistance. The most important part in the management of the second stage is the prevention of perineal lacerations. By avoiding such perineal lacerations the puerperium will be rendered safer, as possibilities

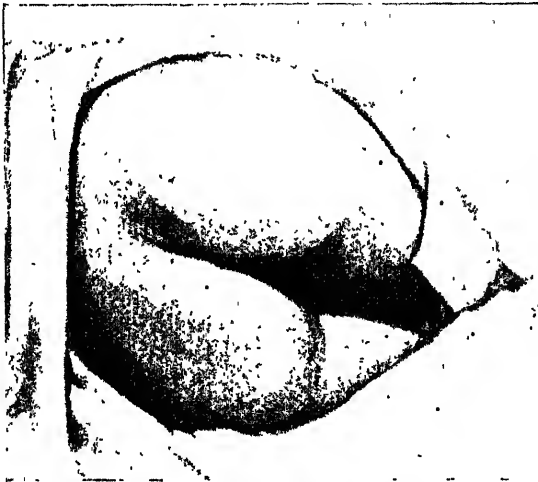


FIG. 44.—Left lateral position.

of sepsis are distinctly less where the perineum is intact and the number of gynaecological complaints at a later stage will also be reduced.

The causes of perineal lacerations are:—

- (1) Relative disproportion in size between the presenting part and the vaginal outlet (soft parts).
- (2) Too rapid expulsion of the presenting part, so that enough time is not allowed for gradual stretching of the perineum.
- (3) Faulty mechanism, whereby a larger diameter of the presenting part emerges through the outlet.

It will thus be seen that what we should aim at is to save the perineum is:—

- (a) To prevent too rapid expulsion.
- (b) To preserve the normal mechanism of delivery.
- (c) To deliver the presenting part in between the thighs.

To prevent too rapid expulsion of the head, the mother should be induced to refrain from bearing down, to open her mouth and breathe deeply during the emergence of the head. If necessary, a light anæsthetic may be invaluable, as it relieves the most excruciating pains of delivery and helps the progress of the head. If there is a tendency for the head to advance too rapidly, counter-pressure should be applied to prevent it from slipping out suddenly.

To promote normal mechanism of delivery and to deliver the smallest diameter of the head to emerge through the



FIG. 45.—Method of delivery of the head avoiding undue pressure on the perineum.

It is necessary to see that extension of the head does not occur, and that the occipital protuberance is well underneath the symphysis pubis.

The delivery of the head between the thighs is distinctly advantageous. With a relaxed perineum the head can be delivered gradually and thus control its progress through the outlet much more successfully.

HOW TO SAVE THE PERINEUM

From what has been stated already it will be seen that whatever method is adopted to save the perineum, the three important precautions enumerated above must be observed.

patient is put in the left lateral position the obstetrician stands behind and passes the left hand and forearm between the thighs of the patient, and uses the fingers of this hand to prevent the sudden exit of the presenting part, and also to assist the normal mechanism of delivery by keeping the occiput pressed posteriorly till it is well underneath the symphysis pubis and till the pelvic floor is sufficiently stretched. At the same time with two or three fingers of the right hand placed on the crowning head he controls the movement of the head in such a way that it may distend the perineum gradually as it is born. Both hands are used to prevent a too rapid advance of the head and to regulate the progress of the head as it stretches the perineum and is delivered. It is desirable that a little chloroform or ether be given on a mask at this stage; as an alternative, the



FIG. 46.—Method of protecting the perineum.

patient should be asked to open her mouth and breathe deeply and not to strain as the head is distending the perineum. An alternative method is where the thumb and fingers of the right hand are placed on either side of the coccyx and the presenting part is pushed up as close to the subpubic angle, as possible, thus making use of all the available space of the pubic arch. In some cases it may be found impossible to prevent lacerations of the perineum. This may be either in operative deliveries or occasionally in normal deliveries. The outlet may be so narrow

and the perineum may not stretch sufficiently to allow the head to be born without a tear.

If a tear is inevitable, the greatest precaution should be taken to see that it does not extend into the rectum and that it is not an irregular, bruised laceration of the perineum. To avoid such a contingency an operation is performed known as *episiotomy*. This consists in cutting through the perineum with a pair of scissors. Episiotomy may be either lateral, medio-lateral or central. In lateral or medio-lateral episiotomy an incision is made into the perineum to one side of the median line and directed away from the rectum. This may be done on one side or both sides. Usually it is not desirable to perform it on both sides. In some cases a central episiotomy may be preferred, but care must

be taken to see that this incision does not extend into the rectum; and as such, central episiotomy should be performed only in those cases where a slight tear of the perineum is likely to result and where it is desirable that the tear should be a clean cut rather than a bruised laceration. In lateral or medio-lateral episiotomy any slight extension is not of much consequence, as from the direction of the episiotomy wound any extension will be further away from the rectum.

After the delivery of the head, the eyelids of the child should be cleaned by means of soft linen soaked in sterile water or boric acid solution; separate wipers should be used for each eye and the lids washed. A piece of gauze should then be used to wipe

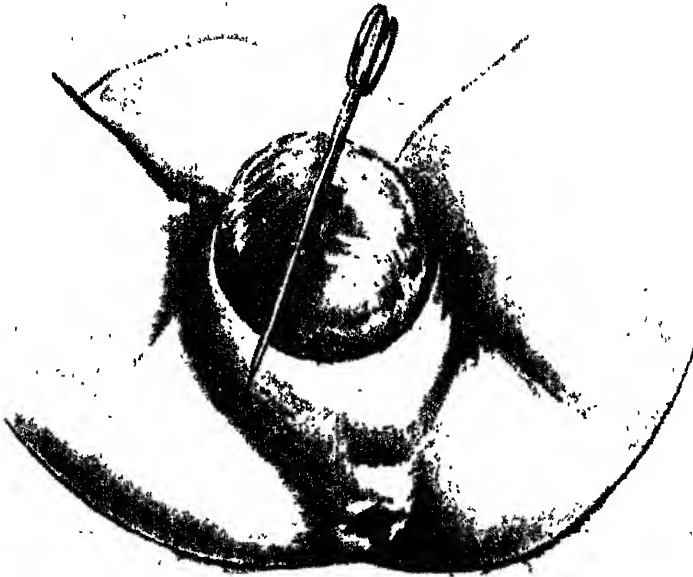


FIG. 47.—Lateral episiotomy.

the lips and nose, and the little finger wrapped with a piece of moist linen should be passed into the child's mouth and any accumulated mucus removed therefrom.

The next step is to find out whether the cord is round the neck. If it is round the neck there are three methods of releasing it:—

- (1) The loop of the cord may be drawn down and slipped over the head.
- (2) If the cord is more than once round the neck it may be clamped and cut between two artery forceps and the cord separated from the neck.
- (3) The loop of the cord may be pushed up and allowed to slip over the shoulders and the head delivered.

DELIVERY OF THE SHOULDERS

After the head is born it is better to wait for the next pain to expel the shoulders by natural powers. During this interval the movements of restitution and external rotation will take place. The anterior shoulder will then hitch against the symphysis-pubis, and the posterior shoulder will be born. It is necessary to take care of the perineum during the delivery of the shoulders,



FIG. 48.—Delivery of the shoulders in a vertex presentation.

as in some cases, either because of a rapid delivery, or because of an increase in the size of the bisacromial diameter, the perineum is lacerated. Delivery of the shoulders should be delayed till complete rotation of the bisacromial diameter has taken place. The head should be held in the hand and gently depressed downwards, so as to get the anterior shoulder well underneath the symphysis pubis. It should then be gently raised up so as to allow the posterior shoulder to be delivered first. As far as possible, delivery of the shoulders should be helped

by traction of the head upwards for the posterior shoulder and traction downward for the anterior shoulder aided by fundal pressure. It is not desirable to apply traction to the axilla, as the chances of fracturing the humerus are by no means negligible.

DELIVERY OF THE BODY

After delivery of the shoulders, the body as a rule is rapidly expelled. Should there be delay, however, the thorax may be held by the hand and gentle traction applied, or the foetus may be expressed by fundal pressure.



Fig. 49.—The position of the child immediately after delivery.

As soon as the child has been delivered it should be placed on its side in between the legs of the mother, covered with a dry towel or a warm blanket, and the chest gently compressed. This will help to make the child cry vigorously, thus establishing respiration. Should the child cry out feebly, or should there be any delay in the establishment of respiration, the cord should be clamped and cut and methods of artificial resuscitation employed.

LIGATION OF THE CORD

Once the child has begun to cry there is no hurry to ligate the cord until pulsations cease. The foetus gets from two to three ounces of maternal blood during this period, which is of invaluable help in its growth. To note whether the cord has stopped pulsating or not, it should be grasped between the index finger and the thumb at the vulval outlet. It is desirable gently to draw out the cord a little, so that no loops lie in the vagina. Once the pulsations have stopped the cord should be ligatured in two places, one ligature about 1 to 1½ ins. from the umbilicus, and the second as close to the vulval outlet as possible. It is desirable to apply this second ligature as a matter of routine to avoid the possibilities of hæmorrhage from the cord in cases of twins, but more chiefly to retain the blood in the placenta, so that the uterus may more easily expel it. It also helps in the recognition of lengthening of

extra-vulval portion of cord during third stage. The cord is now divided close to the umbilical ligature, and this is best done by taking the cord in the hollow of the palm and cutting it with scissors passed between the second and third fingers to avoid



FIG. 50.—Severing the umbilical cord of the child after birth.

injury to the actively moving extremities of the child. After cutting the cord, the stump should be examined to see that there is no bleeding, and it may be touched with some antiseptic and dressed



FIG. 51.—Method of lifting the new-born baby.

with sterile absorbent cotton or gauze and a bandage tied round the naval. After the cord has been ligated the child should be taken up with care, placed in the cradle and wrapped in some warm material.

As soon as convenient, after the child has been separated, the eyes and lids should again be wiped clean, washed with 1 in 10,000 solution of perchloride of mercury, and a drop of 1 per cent solution of nitrate of silver instilled into each eye. This routine practice is very desirable to prevent ophthalmia neonatorum.

PERINEAL LACERATIONS

Once the child has been removed to the cradle the perineum should be carefully examined with the patient in the dorsal position to note any lacerations. It is not sufficient to examine only the skin, as deep lacerations may sometimes be present which it is always desirable to suture immediately after the labour is over.

Where lacerations are present, the question of the repair of the perineum should be considered. In some cases it may be desirable to perform this after the expulsion of the placenta. On the other hand, should the patient already be under the effects of chloroform it is much better to apply sutures to the perineum before the patient comes round. We have rarely found any difficulty in



FIG. 52.—The third stage of labour.

Note the slight elevation due to the expulsion of the placenta into the lower uterine segment.

suturing the perineum and expressing the placenta later, but should the vulval outlet be very narrow and difficulties anticipated, the sutures may be placed *in situ* and only tied after completion of the third stage.

Immediately after the expulsion of the child an antiseptic dressing should be applied over the vulval outlet after preliminary cleaning, and this dressing is retained till signs of separation of the placenta are manifest.

MANAGEMENT OF THE THIRD STAGE

By far the most important stage of labour to manage in a case of normal delivery is the third stage. A careful watch should be kept over the condition of the uterus, the condition of the patient, the amount of hæmorrhage, if any, and the signs of separation of the placenta.

How to ascertain if the Placenta has separated. The following signs and symptoms help to assist one in determining whether the placenta has separated from the uterus or not:—

- (1) The patient will complain of pains associated with uterine contractions.
- (2) There will be a slight amount of vaginal hæmorrhage.
- (3) The extra-vulval portion of the cord will lengthen.
- (4) The fundus of the uterus will rise above the umbilicus.
- (5) There will be a soft elevation above the symphysis with a depression immediately above, indicating that the placenta has separated from the fundus and is lying in the lower uterine segment.
- (6) If the fundus of the uterus is gently grasped and raised the cord will not recede if the placenta has separated; whereas if the placenta is still adherent to the uterus the portion of cord just outside the vulva will be drawn into the vagina.

There is generally a tendency to hasten the completion of the third stage. This should be avoided, and it should be clearly realised that the temporary suspension of the uterine contractions following the expulsion of the foetus is a physiological condition and should not be disturbed.

The common mistakes committed in the management of the third stage of labour are:—

- (1) Undue haste and rough manipulation in the completion of the third stage.
- (2) Premature attempts at expression of the placenta.
- (3) Neglect to ascertain whether the bladder is empty or full.
- (4) To attempt expression of the placenta without provoking uterine contractions and without expressing in the proper direction, namely, downwards and backwards.
- (5) Irregular stimulation of the uterine contractions, when the uterus should be in a condition of rest.
- (6) To attempt to deliver the placenta without care being taken to see that the membranes are expelled entire.
- (7) Sufficient care may not be taken to avoid the possibility of sepsis in receiving the placenta.

The chief objects in view during the management of the third stage are: to promote natural separation of the placenta and membranes and their complete expulsion; to arrest hæmorrhage and to secure good and permanent contraction and retraction of the uterus.

CREDE'S METHOD OF EXPRESSION OF THE PLACENTA

When the signs of separation of the placenta are manifest, that is, when the placenta is lying in the lower uterine segment, an attempt may be made, if it is not naturally expelled, to express it. The reason why the placenta may not be naturally expelled is because the expulsive powers are not sufficiently forcible to project the placenta through the vulval outlet. Hence it may sometimes



FIG. 53.—Crede's method of expression of the placenta. Section.

be retained in the somewhat dilated and relaxed lower uterine segment. To promote proper expulsion of the placenta the uterus must be made to contract and the fundus should be firmly grasped in the palm of the hand and gently pressed downwards and backwards towards the pelvis. When the placenta appears at the vulva little or no traction is necessary, but it should be received by an

assistant, grasped firmly and gently rotated on its axis, so that the membranes are twisted into a rope and so gradually removed. If there is any danger of the membranes tearing it is well to catch hold of them with a pair of artery forceps and by light traction up and down to cause them to be expelled. In some cases it is desirable repeatedly to catch hold of the membranes nearer and nearer the vulval outlet as they are pulled downwards, and thus ensure that the membranes are expelled entire.

Examination of the Placenta and Membranes. As soon as the placenta and membranes have been expelled and received in a basin they are washed with water and the placenta and membranes carefully examined. The uterine surface of the placenta should first be examined to see that the cotyledons lie in close apposition. There should be no defect on the uterine surface at the grooves between the cotyledons or at the margin of the placenta. The membranes are then examined carefully to see that both the

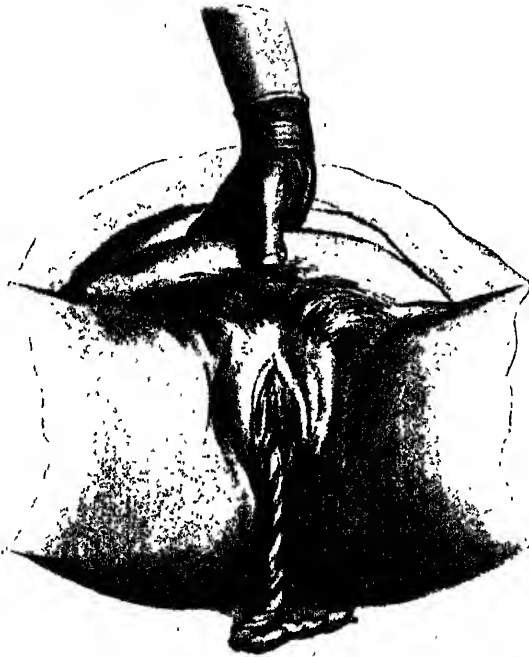


Fig. 54.—Credé's method of expression of placenta.

amnion and the chorion are entire. Any small deficiency in the membranes should be carefully noted, as they may be due to the retention of a succenturiate lobe of the placenta.

Retained Placenta or Membranes. If portion of the placenta or membranes are retained the twin danger of hæmorrhage and

sepsis may result. Any large bits of placenta should undoubtedly be removed immediately by careful intra-uterine manipulation. Where, however, there is some doubt whether a small bit of membrane or a small piece of placenta has been retained it is safe to adopt an expectant plan of treatment. In the large majority of instances the piece of membrane or bit of placenta is passed in the lochia on the third or fourth day of the puerperium. On the other hand, an intra-uterine manipulation to remove this piece is bound to increase the risks of sepsis.

As soon as the placenta has been completely expelled, the patient—particularly if she is a multipara—is given an ecboic, $\frac{1}{2}$ to 1 drachm of *extractum ergotæ liquidum*, or .5 gramme of Ergometrine hypodermically. In some cases, where there is a tendency for hæmorrhage, an injection of the extract of pituitary



FIG. 55.—Third stage of labour. Method of receiving the placenta.

may also be given. The uterus is massaged to promote firm contraction, any clots expressed and the patient watched carefully noting her pulse rate and the occurrence of any hæmorrhage.

Repair of the Perineum. Lacerations of the vagina and perineum should now be carefully sutured with the appropriate sutures, if this has not already been done.

After the completion of the third stage the external genitalia should be carefully cleansed with sterile water or with an antiseptic lotion—Dettol or any other suitable antiseptic. The cleaning should include the thighs, buttocks and the lower parts of the abdomen, since these are usually soiled by blood, etc. If there are abrasions or slight lacerations the parts may be touched with an antiseptic, such as tincture benzoin, tincture iodine or mercurochrome. A sterile or antiseptic pad of some absorbent material should be applied to the vulva and held in position by means of tapes attached thereto, which are tied at the waist, or fixed by safety-pins to the abdominal binder. This antiseptic pad should be changed as often as it becomes soiled—at least every four hours on the first two or three days. The patient should have an abdominal binder applied. This is a great comfort to the patient



FIG. 56.—Examination of the placenta—maternal surface.

and helps to keep the uterus compressed and the intestines from getting distended because of the sudden release of intra-abdominal pressure. Care should however be taken to see that the uterus does not get distended with blood clots while covered under the binder. The abdominal binder may be continued for some weeks

after parturition, as in many of these patients the abdominal wall results if a support is not. The obstetrician should watch the patient for at least the completion of the third stage, and only then if satisfactory should he leave the place.

Care of the Baby. Once the patient has been able to take the care of the baby should be the nurse or the midwife attending. The baby should be dried and the body has been smeared with oil, preferably olive oil. The vernix caseosa can then be easily washed off. The child should be carefully examined for any abnormality. In particular, note if the anus or the urinary meatus is not in the normal position or if there are extra fingers or toes, cleft palate, spina bifida etc. The cord should be carefully secured, the baby bathed and a light dress put on.

The patient should be settled in bed two hours after delivery if she has been on a delivery board, and kept in a quiet room and protected from draughts. She should have a comfortable sleep at this stage, after giving her some nourishment, such as a cup of warm milk, cocoa or a glass of beer. Visitors should be restricted and as much privacy as possible ensured. After the patient has rested for some time she should be put to the breast about six hours after delivery.

SECTION IV

PHYSIOLOGY OF THE PUERPERIUM

CHAPTER XIII

THE PHENOMENA OF THE NORMAL PUERPERIUM

THIS is the period which begins with the termination of the third stage of labour and lasts till the genital organs have assumed their normal condition again. It is no doubt true that once a delivery has taken place the genitalia cannot return to the same condition as before pregnancy.

The normal duration of the puerperium is from six to eight weeks, although in its more restricted sense it covers the period of ten to fourteen days immediately after delivery, during which the more radical changes take place.

The changes that occur during this period are :—

- (1) Changes in the uterus.
- (2) Changes in the cervix, vagina and external genitalia.
- (3) Changes in the breast.

Changes in the Uterus. The most striking feature about the puerperium is the change that takes place in the uterus. Immediately after delivery the uterus is hard, very much reduced in size and the fundus is generally felt about 4 to 5 ins. above the symphysis pubis. During the puerperium the uterus gradually diminishes in size, and by the tenth or twelfth day it can no longer be left by abdominal palpation. This process is known as *involution* of the uterus. The uterus never actually returns to the original state, and in a parous woman it always remains a little bigger and more freely movable than in a nullipara. The rate of involution of the uterus varies with different individuals, but should generally be progressive from the first day onwards. In certain cases, as in anæmic women, and in conditions associated with puerperal sepsis, involution of the uterus may be retarded. In some cases the uterus may be pushed to one side or the other and involution may be interfered with owing to collection of lochial discharge in the cavity.

During involution, fatty degeneration of the muscular fibres occurs and the fat is removed by the lymph stream after autolytic

digestion. The vessels of the uterine wall become closed by thrombi. The closure is considerably helped by the contraction and retraction of the uterine musculature. Eventually the blood clot in the lumen of the vessels becomes absorbed and the vessel walls are then represented by a solid or thinly canalised mass of hyaline tissue.

After delivery, the endometrial surface of the uterus is thick and rough especially over the placental site. Degenerating decidua, blood-clots and bits of foetal membrane may be present in the uterus. Gradually these undergo fatty degeneration and are generally cast off in the lochial discharge. After the greater part of the surface has been thus shed, regeneration takes place from the remains of the mucous membrane and from the epithelium of the deepest portions of the uterine glands. The process closely resembles that of the healing of a granulating surface on a mucous membrane. The regeneration generally begins about ten days after labour and is complete in about a month, except over the placental site.

During the puerperium a discharge is present, which is known as the *lochia*. It consists of blood and decidual membrane and occasionally bits of foetal membrane and clots. The lochia is generally red for the first three days, and later becomes pink, gradually becoming pale. It lasts for ten to twelve days and may return again after two or three weeks, when the patient attempts to move about freely.

The *quantity* of the discharge varies with different individuals. Generally the number of diapers stained during the twenty-four hours gives an approximate idea as to the quantity of lochia passed. In some pathological conditions, such as anaemia, the lochia may be very scanty. In cases of retroflexion of the puerperal uterus, the lochia may be retained and get decomposed. Occasionally in certain septic conditions, particularly septicæmia, there may be suppression of lochia. The lochia may, on the other hand, be increased in quantity in cases where there has been a large placental site, as in twins.

Other points to be noted about the lochia are its *colour*, *odour*, *quality* and *method of staining on the diaper*. The colour varies with the period of the puerperium, and as has been stated above, usually it is bright red for the first two or three days, pink for the next three days, gradually becoming pale subsequently. Ordinarily, healthy lochia has got a sweetish-mawkish odour, but if organisms have gained admission the smell may be very offensive.

By the *quality* of the lochia is meant its composition. In some cases where bits of membranes or placenta are left behind in the uterus they may be found in the lochial discharge. Not

infrequently decomposing blood clots may also be expelled. If the tissues have been damaged, sloughs from the cervix or the vagina may be passed.

The *method of staining* on the diaper must be noted. Healthy lochia stains more deeply in the centre than at the edges; while if it is unhealthy and decomposing the edges are more deeply stained than the centre. In healthy lochia the deeper staining at the centre is due to the deposit of the heavier corpuscular element, while the serum exudes to the peripheral area and stains less deeply; in unhealthy lochia, on the other hand, the corpuscular element is decomposed and the edges tend to stain more deeply and so there is usually more uniform staining.

Changes in the Cervix, Vagina and External Genitalia. The cervix also participates in the general involution of the uterus and its canal gradually becomes smaller and smaller. The cervix, however, never returns to the non-gravid state, the external os of the cervix being always patulous in a multipara, while it is closed in a nullipara.

The vagina takes some time to recover from the distension to which it was subjected. The vaginal outlet is markedly relaxed and signs of laceration may be noted. The hymen completely disappears as such, and its place is taken by a number of small tags of tissue which cicatrise and are known as *carunculæ myrtiformes*. This is a characteristic sign of parity.

The perineum is also relaxed, the degree of which depends upon whether it has been lacerated or not during the process of delivery.

The pelvic floor is stretched during the process of delivery, and will be found relaxed. Gradually there is a regain of tone, but a certain amount of gaping of the vulva usually remains in a parous woman.

Changes in the Breasts. After delivery, lactation is established in the breasts and the mother can nourish the child with breast milk. Unlike mammals, milk is not secreted by the mother till the second or third day of the puerperium. For the first twenty-four hours and sometimes for forty-eight hours following delivery, a thin liquid is secreted from the breasts, which is known as *colostrum*. The breasts become larger, fuller, the veins become more prominent, and the patient has the feeling that the secretion of milk is beginning. If the child is put to the breasts regularly, the milk begins to be secreted gradually in increasing quantities. The colostrum that is secreted within the first twenty-four hours is of a deep yellow colour, alkaline in reaction, and if a drop of it is examined under the microscope, it will be found to consist of fat globules, a watery fluid and some corpuscles known as *colo-*

trum corpuscles. These corpuscles are round, ovoid or stellate cells, which contain one or two nuclei. Colostrum contains very little, if any, casein, but a great proportion of lactalbumin and lactoglobulin with much fat. It has a slight laxative action on the new-born baby and helps to clear the meconium from the intestines.

The milk that is secreted after forty-eight hours differs from the colostrum. Human milk is an opaque, slightly yellowish liquid, with a sweetish taste and a characteristic odour, and is slightly alkaline in reaction. The specific gravity varies between 1025 and 1035. The composition also varies, but generally the average analysis results are as follows:—

Water	.	.	.	.	.	87.3 per cent.
Proteins	.	.	.	.	.	2.0 "
Fat	.	.	.	.	.	3.5 "
Sugar	.	.	.	.	.	7.0 "
Salts	.	.	.	.	.	0.2 "

The quantity of milk secreted varies with individuals and with the race. Thin women have a more abundant supply of milk than fat and flabby individuals. Nervous women naturally produce less milk. The secretion is influenced by various factors, among which may be mentioned diet, mental emotions, drugs, menstruation and pregnancy. Emotions may alter the quality and quantity of milk. The milk gradually dries up if another pregnancy starts during lactation; if the woman is menstruating the milk may have an adverse effect on the child and may cause diarrhoea, intestinal colic, etc.

Certain drugs may be secreted through the milk and thus affect the infant. Prominent amongst these are cathartic purgatives, alcohol, opium, iron, arsenic, iodine, lead and mercury. In diseased conditions of the mother, the secretion of milk is very likely to be diminished or suppressed, particularly in acute illness, in diarrhoea, dysentery, tuberculosis, etc. Certain foods and drugs are supposed to increase the quantity of milk. These are called galactagogues. It is common for mothers to be given fish, tomatoes, gruels and plenty of milk. Overfeeding, however, may occasionally dry up the breast by increasing the deposit of fat. Fever during the puerperium may decrease the quantity of milk. The secretion in the breasts may be re-established by proper massage and by putting the child to the breast at frequent intervals. The amount of milk secreted varies with the demand and with the individual. Usually about two to three pints per day are secreted.

Changes in the Abdominal Wall and Peritoneum. Synchronous with the changes that take place in the uterus and

vagina, the pelvic peritoneum and the structures of the broad ligament accommodate themselves to the changed conditions. The striæ gravidarum do not disappear. As a result of the continued distension during pregnancy the abdominal wall remains flat and flabby for some time. A certain amount of this laxity and flabbiness will remain permanently unless proper exercises for the abdominal muscles are persevered with. Occasionally divarication of the recti muscles is met with, so that one can easily pass a hand in the median line between the two recti and palpate the abdominal contents. Here again proper exercise and massage will help to regain the tonus of these muscles.

CHAPTER XIV

THE CARE OF THE PUERPERIUM

THE care of a pregnant woman does not end with the delivery of the child and the conclusion of the third stage. In fact, both for the immediate and the ultimate prognosis, a good deal of care is required during the puerperium if the patient is to escape the immediate risks and at the same time, not predispose herself to many of the remote gynæcological troubles associated with neglect during the puerperium.

We may describe the care of the puerperium under two heads:—

- (1) Immediate care after labour is over; and
- (2) The subsequent care during the remainder of the puerperium.

IMMEDIATE CARE AFTER DELIVERY

In the chapter on the conduct of labour we have dealt with the steps that ought to be taken for the mother and the child up to the completion of the third stage of labour. After careful examination of the placenta, the mother's pulse, the condition of the uterus and any tendency to hæmorrhage should be noted. Two to four hours after the end of the third stage, if the general condition is satisfactory and the uterus is firmly contracted and there is no tendency to hæmorrhage the patient can be removed from the delivery board to a bed. Before doing so a toilette of the vulva is essential. The external genitalia are washed with an antiseptic lotion—1 in 2000 perchloride of mercury or dettol, or any other suitable antiseptic. If the perineum has been sutured, particular care be taken to see that it is properly washed, dried, painted with an antiseptic such as mercurochrome, tincture benzoin co., or

tincture iodine, etc., and then a sterile vulval pad made of cotton-wool wrapped in a piece of gauze is applied over the genitalia. Such pads are available on the market as sanitary pads, and it will be well for the patient to have a liberal supply during the whole of the puerperium. The pads should be changed every three or four hours and every time after urination or defecation. At each change the genitalia should be cleansed, using fresh cotton pledgets soaked in antiseptic solution, care being taken to see that the parts are washed from above downwards and never from below upwards.

Binder. It is our custom to apply an abdominal binder for the first twenty-four to forty-eight hours. Controversy has arisen as to the value of an abdominal binder. Extreme opinions are held and it has been suggested that the abdominal binder, far from being useful, is a hindrance to the proper exercise of the abdominal muscles, and should accordingly have no place. While the continued use of the binder may possibly favour the patient lying in bed too long and not exercising her abdominal muscles, we feel that for the first twenty-four to forty eight hours it serves a definite purpose. It gives a feeling of support to the mother, and if properly applied will help to control the uterus and prevent it from getting distended with clots. After forty-eight hours it should be removed and the patient encouraged to exercise her abdominal muscles.

After-pains. In some cases the patient complains of very severe pains, which may be more painful than labour pains. After-pains are more likely to occur in multiparæ, in women who have had a precipitate labour, and in primiparæ where the uterus was overdistended, and in cases where clots have been left inside the uterus. The pains are due to lack of tonus of the uterine muscle, and if severe they may keep the patient awake and cause her much discomfort. It is best under these circumstances to give the patient injections of prostigmine or an ecbolic like Ergometrine and to ensure sleep a hypnotic, such as one of the barbituric acid preparations and in rare cases morphia.

CARE DURING THE SUBSEQUENT PERIOD OF THE PUERPERIUM

Following the delivery the patient should be visited every day for the first eight or ten days, and the following points should be noted:—

- (1) General Condition of the patient.
- (2) Temperature, pulse, respiration.
- (3) Rest, diet and sleep.
- (4) Rate of involution and condition of the uterus.
- (5) Lochia, its nature and quantity.

- (6) Condition of the bladder.
- (7) Condition of the bowels.
- (8) Condition of the breasts.

Simultaneously with the attention paid to the mother, the child should also be examined and the condition of the umbilical cord, the condition of the bowel and the bladder, general condition, its nourishment and weight should be noted. These points will be elaborated in the chapter on the care of the new-born baby.

Proper care of the puerperium consists in attending to the following details.

Rest. It is important to realise that a woman after labour is exhausted and complete rest is essential. In fact, it is wise during the first week to restrict all visitors and allow only the intimate members of the family to see the patient at definite hours. Immediately after labour, and when the patient has been settled in bed, she generally goes off to sleep and awakes refreshed. While the patient should be given plenty of rest, it is at the same time necessary to realise that she should not be confined to bed too long. In a normal case it is well to prop up the patient in bed, on the third day, to allow her to sit up on the fifth day, and let her walk about round the bed on the seventh day. The patient will be in a fit condition, to move freely from the tenth day onward. However, in cases of instrumental delivery, or where any complications are present, obviously the period of rest must be prolonged, and it will depend upon the condition of the patient as to when she can be allowed to sit up. Particularly in cases of postpartum hæmorrhage it is desirable to prolong the period of rest. Cases are on record where an attempt to sit up in bed early has resulted in pulmonary embolism and sudden collapse.

In the tropics it is exceedingly difficult to persuade some women to stay long in bed, owing to financial considerations and the lack of proper assistance at home, and it is not infrequent for the patient to get discharged from hospital on the fifth or sixth day. On the other hand, a too prolonged stay in bed is equally undesirable. It produces the impression of serious illness in the patient and her relatives. The movements essential for the proper involution of the uterus and the free flow of the lochia, as well as the proper exercise of the muscles both of the abdominal wall and of the pelvic floor, cannot be obtained unless the patient is allowed to sit up on the fifth day.

Diet. The old idea that a very limited diet should be given to the puerperal woman and that it should largely consist of liquid diet is no longer held. Immediately after delivery, and probably for the first forty-eight hours, it is desirable to limit the diet to liquid nourishment. Once the bowels have moved freely the diet

may be more generous—solids being introduced in the shape of toast or biscuits on the third day, and the ordinary diet allowed on the fifth or sixth day.

Temperature. One of the most important things to watch carefully is the temperature. The normal puerperium should be apyrexial. The temperature should be recorded at intervals of every four hours and any rise above 100° should be especially noted. It is not infrequent for a slight rise of temperature to be present within the first twenty-four hours after delivery; occasionally the woman may even get a chill with rigor and the temperature shoot up to 101° to 102° . Generally, however, within twenty-four hours the temperature comes back to normal and keeps normal. Any rise of temperature thereafter must be viewed with suspicion, and it should be presumed that every such rise is due to septic causes, uterine or urinary, unless these can be satisfactorily eliminated. Particularly in the tropics, there are many other conditions which may give rise to pyrexia in the puerperium. Several tropical diseases such as malaria, kala-azar, amebiasis, dengue, or influenza, may occur; diseases like tuberculosis, enteric fever, pneumonia are not infrequent. Even so, the presumption should always be in favour of the possibility of septic infection, till every attempt has been made to disprove its presence.

Pulse. During pregnancy and in the puerperium, a physiological bradycardia is not uncommon. A rise in the pulse-rate is a more sensitive index of abnormality than even the temperature. If the pulse-rate is above 90 the attention of the physician should be drawn to it. The relation between the pulse and the temperature is a factor to be taken into consideration. In severe cases of uterine sepsis the increase in the pulse-rate will be found out of proportion to the rise in temperature. In cases where the temperature is due to other causes such as malaria, etc., the pulse-rate may not show any disproportionate increase.

Respiration. The frequency with which complications in the lungs may occur in the puerperium makes it necessary to record the rate of respirations as well. The patient may have an attack of pneumonia or broncho-pneumonia or sometimes the complications in the lungs may be the sequelæ of septic conditions.

Bowels. It is essential to take note of the state of the bowels. It is usual for the patient who has been healthy and moving about to become constipated when she suddenly takes to bed after delivery. It is an immemorial custom to give the patient a dose of castor-oil on the third day after labour. Care must, however, be taken to see that the genitalia are well cleaned and protected after every evacuation of the bowels. In cases where the perineum has been sutured it is better to avoid administering purgatives.

Opinion is not altogether unanimous as to the desirability of giving a purgative during the puerperium, and some obstetricians prefer to allow the bowels to move of their own accord, in view of the possibility of septic contamination from a free purgation of the bowels if not properly attended to. Occasionally the bowels may be moved by enemata, and this is perhaps preferable in cases where the perineum has been sutured. The patient in some cases does get a rise of temperature owing to constipation and the consequent absorption of intestinal toxins. In such cases a brisk purgative is helpful, as it not only eliminates the intestinal toxins but promotes the involution of the uterus.

Bladder. The care of the bladder is important in the puerperium. In some cases of natural labour, but more frequently after operative deliveries, the bladder does not empty itself freely or completely. This is more likely to occur if there has been any laceration of the perineum or urethra or clitoris. In such cases, if care is not taken, the bladder becomes overdistended, and as a consequence presses upon and tends to promote backward displacement of the puerperal uterus. Such a displacement causes retention of lochia, a condition known as *lochiometra*, which may later, owing to pyogenic organisms gaining admission, become a *pyometra*. A vicious circle is thus set up. Consequently, in the early days of the puerperium, utmost care should be taken to see that the bladder empties itself without resort to catheterisation. In spite of all care, catheterisation is attended with risk of sepsis. A good method of favouring the emptying of the bladder is gently to massage the lower part of the abdomen and then pour some hot water over the genitalia while the woman is propped up in bed. If the bladder does not empty itself freely, an injection of pituitary extract, $\frac{1}{2}$ c.c. or carbachol, may be of help. Failing these, catheterisation is necessary, but should be done with all due aseptic care. If frequent catheterisation has to be resorted to it is well to put the patient on urinary antiseptics for a few days.

Involution of the Uterus. It has already been stated that the uterus gradually involutes during the puerperium. Immediately after labour, the fundus of the uterus is at the level of umbilicus or one or two fingers below. Occasionally the uterus may be displaced to one side or the other—more often to the right, in which case it is well to bring it to the median line and then ascertain the height of the fundus above the symphysis pubis. The most important thing to note in the puerperium is the rate of involution of the uterus. Sometimes on the second or third day, the uterus may not be palpable abdominally. This should at once arouse suspicion of the possibility of a backward displacement of the puerperal uterus. The height of the uterus should be noted

on each day and should be charted to observe the progressive rate of involution. Before ascertaining the height of the uterus the bladder must be empty. A distended bladder will push it up. In normal cases the level of the fundus will be found to descend a finger's breadth with each day of the puerperium, and by the tenth or twelfth day it should be a pelvic organ once more.

The Lochia. At each visit the obstetrician should carefully examine the lochia. As previously mentioned, the quantity, the quality, the odour, the method of staining on the diaper and the presence of any abnormality in the discharge should be noted. The lochia is generally known as lochia rubra, lochia serosa, and lochia alba, depending upon the colour. Usually for the first three days it is red, and is called *lochia rubra*; for the next three days it is more sero-sanguinous, and is called *lochia serosa*; while after that it tends to become pale and is called *lochia alba*.

The lochia may occasionally be brown or even dark, as a result of decomposition. The smell of the lochia is said to be sweetish-mawkish, and any variations in the odour should arouse suspicion of sepsis. Complete suppression of the lochial discharge may be due either to retention, or to suppression as in cases of septicæmia. During the puerperium the diaper should be frequently changed, particularly if the lochia is abundant and offensive, and the parts well washed and protected whenever the diapers are changed.

Sleep. The mother requires plenty of sleep during the puerperium. One of the earliest symptoms of sepsis or puerperal insanity is sleeplessness. The room must be quiet and shaded and care must be taken to see that the child does not disturb the mother during her periods of sleep. In most cases, if the child be properly fed, it is possible to avoid a feed in the middle of the night. A glass of hot milk, the last thing at bedtime, a well-ventilated room, complete quiet, a careful and helpful demeanour on the part of the nurse attending her and freedom from worry over the child will all favour sleep.

It is inadvisable to give the patient any sedative to promote sleep. In some cases where the woman is of a nervous temperament, or has mental worries, it may be necessary to give her sedatives.

Breasts. Care of the breasts must begin from the later weeks of pregnancy. If sufficient care has been taken to keep the breasts clean and have the nipples drawn out, touched with spirit and protected, no trouble should arise during the puerperium. Once the

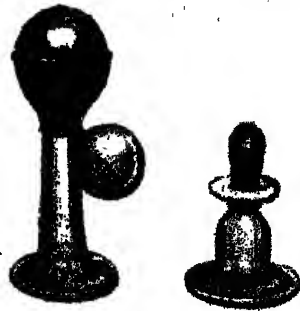


FIG. 57.—Breast reliever and the nipple-shield.

baby has arrived, the nipples should be washed with boric lotion and dried before and after each feed. The child should be put to the breast at regular intervals, generally every three hours, between the hours of 6 A.M. and 10 P.M. Particular care should be taken to notice any cracks or other abrasions, and if such be present the parts should be well cleaned, kept aseptic, and the child breast-fed with the help of a nipple-shield. It is important to make every mother realise the need for breast feeding in the interests of the baby. In the early days of the puerperium it also helps to promote involution of the uterus. Breast milk probably contains some of those antibodies that are essential in the early days to protect the child from infections. The fact that she is nursing the baby has got a good moral effect upon the mother who will take better care of her health and habits. In cases of syphilitic children the mother is the only person that ought to nurse. In puerperal sepsis or certain general constitutional diseases, such as tuberculosis, anæmias, etc., it may be necessary temporarily to wean the child from the mother. The method of feeding under such circumstances will be discussed elsewhere.

The Care of the Perineum. In all cases where lacerations of the perineum have occurred during labour, the necessity for immediate suture has been emphasised. This lessens the chances of puerperal infection. The re-formation of the pelvic floor serves to preserve its tonus, so that the tendency for prolapse at a later date is diminished. In case the perineum has been sutured, care must be taken during the puerperium to see that the parts are kept clean and dry. The perineum should be attended to morning and evening and after each urination or defecation. Antiseptics may be used, such as tincture benzoin co., mercurochrome, etc. The genitalia should be washed with a mild antiseptic lotion, dried and protected by a piece of sterile gauze. Where a complete perineal tear has been repaired, the bowels should be bound till the fifth day of the puerperium, after which a purgative, such as castor-oil, may be given. It is desirable to soften the faecal matter in the lower part of the rectum by injecting a couple of ounces of glycerine or olive oil before the bowels move; otherwise, after the bowels have been constipated for five days, the scybalous masses are hard, and in the effort to expel them the stitches may cut through. Usually the stitches may be removed on the seventh or eighth day, but the patient should be cautioned to keep her thighs together and not to move about till the fourteenth or fifteenth day. If the stitches tend to cut through, they should be removed earlier. If the perineum has not healed satisfactorily, the patient is advised to seek further treatment at the end of the third month after delivery.

General Condition of the Patient. The usual care taken of any patient confined to bed must be followed in cases of puerperal women. Daily sponging, care of the back, the groins and the axilla, plenty of fresh air and light, a cheerful atmosphere about the room and restriction of visitors are desirable. As has been already stated, the patient should be encouraged to sit up and move about. She should at the proper time exercise her limbs and abdominal muscles, and if this precaution is taken she is not likely to feel the strain when she attempts to get up for the first time. Gentle diversion by way of light literature, pleasant conversation and freedom from worry, and good sleep at night, all these favour a rapid recovery.

Postnatal Care

It is advisable at this stage to stress the need for postnatal care. Every woman should be examined two weeks after delivery. Particular care should be taken to see if there have been any lacerations of the vagina or perineum not previously recognised. Note is also made of lacerations of the cervix, the position of the uterus, whether displaced backwards or laterally, whether it has completely involuted, or there is any degree of subinvolution; whether there is inflammation of the pelvic cellular tissues or of the adnexa; whether the patient complains of any pain round about the groins, or there is any evidence of subluxation of the joints. Such an examination will reveal the necessity for further treatment at a later stage, and the patient should always be advised on this subject. If any damage is noted, it is desirable to advise the patient to submit herself again for an examination at the end of six to eight weeks after delivery, when there will be a better appreciation of the extent of the damage and the nature of the treatment required. The detailed management of the postnatal period has been separately dealt with in the Appendix.

CHAPTER XV

CARE OF THE NEW-BORN CHILD

The sudden transition from the protected environment of intra-uterine life to the risks of extra-uterine existence is beset with certain dangers to the new-born child. Care is required, therefore, till it becomes acclimatised to its new surroundings and to the new methods of existence. The new-born child has now to undertake for itself the functions of digestion, respiration, excretion and maintenance of the general body warmth, and the ac-

factory establishment of these involves the observance of certain physiological principles.

Care immediately after Delivery

As already described, immediately after delivery ensure that the child breathes and cries out, that the umbilical cord is properly ligated and severed. The child is then wrapped in a warm towel or blanket and placed in the cradle till the third stage of labour is over. Thereafter the child should be examined in detail to note if there are any abnormalities present. It should then be properly cleaned. The body is covered with blood and vernix caseosa, and to remove these it is best to smear it with warm oil such as olive oil or albolin, which dissolves the vernix. Then the body is wiped with a soft towel. In the tropics it is preferable to give the child a warm bath. The cut end of the umbilical cord should be washed with an antiseptic solution and touched with a drop of tincture of iodine. Sterile gauze is then applied with a small bandage round the belly to keep it in position.

Care of the Eyes. As soon as the head is born, and before the child can open its eyes, the lids should be swabbed with pledgets of cotton-wool soaked in boracic lotion—a fresh pledget should be used for each eye. Further attention is necessary and is carried out during baby's initial toilet. The eyelids should be wiped with swabs soaked in boric lotion and the lids then properly opened so that a drop of 1 per cent. solution of silver nitrate can be instilled into each eye as a prophylactic against gonorrhoeal ophthalmia. It is wise to take this precaution in all infants born in institutions. In private practice, unless the obstetrician is sure that there is no possibility of gonococcal infection, it is wise to instil the silver nitrate solution.

Bowels. During the first two or three days, the stools consist of meconium, which is a greenish-black semi-solid substance with a great deal of bile pigment in it. Faeces begin to appear on the third day after delivery. During the first two days the colostrum that the baby gets from the mother's breast has a laxative effect and enables the meconium to be expelled. Ordinarily, the number of motions per day should be limited to three or four, and they should be of a soft consistency and yellowish in colour. Change in the colour or frequency of the stools is a sign of gastro-intestinal upset. The anal region should be properly cleaned and protected. Frequent changing of the napkin, the use of dusting powders and the avoidance of any rough cloth for cleaning the anal region are essential to prevent excoriation of the buttocks.

Micturition. The infant should micturate within the first twelve hours; if not, the parts should be examined to see if any

congenital deformity exists. In the male a tight prepuce or congenital phimosis may be the cause. Occasionally the meatus may not be patent, and it is necessary to pass a sterile probe to open it.

Care of the Umbilical Cord. The umbilical cord, which has been dressed soon after birth, should be attended to every day. The binder should be changed whenever it becomes soiled and the dressings of the cord should be renewed daily. Usually the cord dries up and separates on the seventh or eighth day. Occasionally there may be some sign of inflammation. The cord must be allowed to drop off by itself and no attempt made to hasten separation by pulling on it.

The Weight of the Child. During the first four days the infant loses weight, on an average about half a lb., for a normal baby weighing 6 lbs. A more rapid loss of weight is suggestive of some pathological condition. Breast-fed infants lose less than infants fed artificially. After the first four days the infant should gradually gain weight. An excessive gain in weight in a short time is suggestive of some defect in feeding, such as overfeeding. Premature infants lose more weight relatively and are slow to regain it. The weight is perhaps the best index of the progress of the infant and should be estimated daily for the first fortnight, and at least twice a week thereafter. The weight should be charted so that a graphic record may be available for ready reference.

Clothing. Warm yet light clothing should be used. The extremities should be fairly free for movements. The napkin should be applied and changed frequently.

Bath. The child should be given a bath daily. This is certainly of importance in tropical countries. After the daily bath it is advisable to use a dusting powder, especially about the groins and the axillæ and the neck, to keep the parts dry and clean. It is useful to smear oil over the whole body before giving the child a warm bath.

Breast-Feeding

The most appropriate food for the baby is mother's milk, and breast-feeding should be insisted upon. Six hours after birth the child is put to the breast. The advantage of this is twofold. Apart from the maternal instincts thereby satisfied, the suckling of the child at the breast promotes better involution of the uterus and the colostrum ingested by the baby has a slight laxative effect. Before and after the child is put to the breast, it is necessary to clean the nipples. The time to be taken for each feed depends upon the ease and speed with which the child gets the required amount of milk. It should be put to the breast at intervals of four

hours, except during the night, for the first forty-eight hours, and preferably the breasts should be used alternately. The nursing may last from ten to twenty minutes. The advantages of breast-feeding are: (1) mother's milk is best adapted to the digestive capacities of the child; (2) the milk is sterile; (3) it is a perfect food and supplies all the vitamins that are necessary; (4) it confers some degree of immunity to infections.

After the first forty-eight hours the child should be put to the breast at regular but more frequent intervals, generally of three hours, between 6 A.M. and 10 P.M., with, if necessary, one feed in the night. The mother must be impressed with the fact that the success of breast-feeding depends upon the following factors:—

- (1) Regularity of feeds.
- (2) A definite time taken at each feed.
- (3) The proper care of the nipples and the breast.
- (4) The maintenance of an equable temperament with proper diet and adequate rest, all needed for efficient lactation.

Contra-indications for Breast-Feeding. Under some circumstances breast-feeding is contra-indicated.

(1) Certain diseased conditions of the mother, such as tuberculosis, cardiac disease, acute illnesses, or contagious diseases, severe grades of anaemia, severe puerperal sepsis, reproductive insanity.

(2) Local conditions preventing breast-feeding: fissures of the nipple, acute mastitis, abscess of the breast, defects of the nipples such as incurable retraction.

Syphilis in the mother is not a contra-indication to nursing. Indeed the syphilitic child stands in greater need of breast milk than a healthy child, and as both the mother and child are infected there is no increased risk.

Sometimes breast milk may not agree with the child, or may not prove sufficient. Deficiency in the quality or quantity of the milk may be due to several causes. Among these may be mentioned: (1) general ill-health of the mother, (2) grave nutritional disturbances and dietetic deficiencies, (3) defective development of the breasts, (4) worry and mental emotions on the part of the mother, or severe physical strain and exhaustion.

The quantity of milk secreted by the breasts does not depend upon the physical proportions of the mother. Spare women have got very efficient lactating breasts, whereas well-proportioned and stout individuals often show a deficiency of breast milk. Occasionally sucking may provoke such a free flow of milk that the child may get suffocated.

"Wet Nursing"

Where mother's milk is not available a wet nurse may be employed. Care must be taken in the selection of a proper wet nurse and the points to be observed are:—

(1) The wet nurse should be a person who has a baby about the same age as the infant to be suckled.

(2) Her breasts must be properly developed and she must have a sufficiency of milk.

(3) She must be free from any infectious or communicable disease; in particular, care must be taken to see that she is not suffering from syphilis; and for this purpose we strongly advocate a Wassermann reaction being done.

(4) The diet of the wet nurse should be regulated and generally her life must be subjected to certain restrictions. She should not be addicted to drugs or alcohol; she must be of cleanly habits; must have an equable temperament and must be straightforward and honest.

The obvious difficulties of fulfilling the various conditions stated above are such that a wet nurse is usually not a practical proposition. Unless there is a relative who can nurse the baby or a person of known character is available as a wet nurse, it may be introducing a serious strain in the family life to allow a newcomer to bear the responsibility of looking after and feeding the newborn child. For these reasons methods of artificial feeding have come more into vogue and have supplanted wet nursing.

Artificial Feeding

There are certain conditions where artificial feeding may be necessary because breast milk is not available or is not sufficient. Artificial feeding has now assumed great importance because of the greater need for resorting to it. A detailed consideration of the subject is possible only in a text-book on "Pædiatrics," but we refer here to some of the salient features.

By far the commonest available food which can be substituted for human milk is cow's milk. But cow's milk is not of the same composition as human milk. It varies in certain important respects and so has to be modified suitably to make it approximate to human milk. The composition of cow's milk and human milk is as follows:—

	Human milk.	Cow's milk.
	Per cent.	Per cent.
Protein	2.0	4.0
Fat	3.5	3.5
Sugar	7.0	4.0
Salts	0.2	0.6

Besides these variations in composition, it has to be noted that in cow's milk there is a heavy percentage of caseinogen, which forms a thick curd when mixed either with acid or with rennet and presents difficulties in digestion. It is to reduce the quantity of protein that dilution is indicated, but as this results in further diminishing the quantity of sugar and fat it is necessary to add sugar in the form of cane-sugar and fat in the form of cream to bring it approximately to the composition of human milk. It is not only in regard to dilution that care has to be taken, but the milk has to be rendered sterile before being given to the infant. There are three different methods of sterilising milk:—

- (1) Sterilisation.
- (2) Boiling.
- (3) Pasteurisation.

By **sterilisation**, which consists in continuous boiling for an hour or heating with superheated steam at a temperature of about 235° F., all the bacteria, pathogenic and non-pathogenic, and their spores are destroyed; it is theoretically an ideal method of rendering the milk pure; but in practice it is not to be recommended, as sterilisation not only destroys the bacteria but also the vitamins so essential for the proper growth of the infant.

Boiling, which consists in bringing the milk to boiling-point but not prolonging the process, destroys the bacteria including the tubercle bacillus. It is a simple and safe method of rendering the milk bacteria free. But it diminishes the activity of the antiscorbutic vitamin.

Pasteurisation consists in heating the milk to a temperature not exceeding 160° F. for twenty to thirty minutes. It is said to destroy all organisms, except certain spore-bearing ones. This seems the best method of preparing cow's milk, because it kills the microbes but preserves the vitamins, and for this reason it is generally recommended.

To dilute cow's milk, boiled water, barley-water or lime-water can be used. Another diluent not infrequently used is whey. The whey should be carefully prepared if it is to be of any value. If whey cannot be obtained, barley-water has the advantage over plain water of rendering the curd more flocculent. In most cases a healthy infant is able to digest milk diluted with water, and this perhaps is the simplest method.

When artificial feeding is resorted to, great care is required in regard to—

- (a) The number of feeds per day.
- (b) The proper dilution and preparation of cow's milk for different age periods.
- (c) The quantity of diluted milk given at each feed.

- (d) The choice of the feeding-bottle and its proper sterilisation.

As regards the *frequency of feeds*, it may be stated that a healthy child may be fed at intervals of three hours by day and once in the night up to the third month; from the third month to the sixth month, at intervals of four hours; and later the feed at night may be given up.

The *dilution of cow's milk* at the different age periods should be as follows:—

	Milk.	Diluent.
First four weeks	1	3
One to three months	1	2
Three to six months	1	1
Six to eight months	2	1
After eight months up to one year .	3	1

The *quantity* of diluted milk given at each feed should be as follows:—

During the first week the feed should be $1\frac{1}{2}$ oz.

At the second week 2 oz.

At the end of the sixth week $2\frac{1}{2}$ oz.

At the tenth week 3 oz.

And from this time up to the end of the eighth month the feed should be at 1 oz. per every month of age, that is, 4 oz. at four months, 5 oz. at five months, and so on.

The proper method of regulating the feeds is to take the calorific value of the feed and base it on the calorific requirements of the baby as judged by the body weight. The following table represents the daily calorific needs of an infant:—

	1 lb. of body weight.
Up to three months	45 to 50 calories.
Three to six months	40 " 45 "
Six to twelve months	35 " 40 "

A good method of checking if the quantity of food given is sufficient, excessive, or deficient, is to record the weight and compare this with a normal weight curve charted for an average baby. If the curves run parallel and closely simulate each other, it may be taken that the quantity of feeds given are near the amount needed. If the infant's curve falls below and lags behind the quantity of food will have to be increased. If the curve, on the other hand, ascends markedly, above the normal curve, the quantity of each feed will have to be cut down.

Care of the Bottle. Whatever may be the artificial food given to the baby, great care is necessary in the proper selection of the bottle and in its thorough sterilisation. The best bottle for infant feeding is the boat-shaped pattern, with openings at both ends, so that it can be thoroughly flushed out and cleaned. The

nipple also should be properly selected, so that it is not too soft or too tough. The flow should be regulated so that it will flow drop by drop almost continuously. The bottle and the nipple after thorough cleaning should be boiled and preserved in sterile water, ready for use whenever necessary. If the nipple gets sodden it should be changed. The sterilised milk and the boiled water should be kept covered, and they should be diluted in proper proportion and warmed before being put into the feeding-bottle. Any remains of a feed should be immediately thrown out and the bottle thoroughly cleansed.

Proprietary Foodstuffs

DRIED MILK

The use of dried milk has become very popular. It is generally prepared by passing a sheet of cow's milk over superheated metal, by which process the milk is reduced to fine powder, which is collected and stored in tins. There are certain advantages in the use of dried milk. It is sterile, the nutritive value seems to be uninjured, it keeps well, and can be utilised where fresh cow's milk is not available or the quality of the milk is doubtful. Some of the vitamins are destroyed, and for this purpose it may be necessary to add these in other ways. The disadvantages are (1) some of the vitamins are destroyed as stated above, and (2) certain of the valuable properties of mother's milk, such as the power to increase immunity and resistance to infection, are not present.

Examples of dried milk are Glaxo, Cow and Gate Food, Tru-Food, Dryco, etc.

OTHER PROPRIETARY FOODS

There are innumerable patent foods on the market which have not all the properties that are so elaborately advertised in their favour. They have their uses, provided their limitations are borne in mind and they are used for short periods, or with such precautions as may be necessary in each case. These foods may be divided into five categories:—

(1) Those consisting of dried milk with the addition of completely malted cereals: *Examples*—Horlick's Malted Milk, Allenbury's Food 1 and 2. In these preparations the starch has been completely converted into soluble carbohydrates, so that the infant is enabled to digest them in that form.

(2) Those consisting of dried milk with the addition of partially malted cereals. These foods therefore contain some starch. *Example*—Nestle's Food, Mylo Food.

(3) Entirely malted cereals. Mellin's Food is the best known. It contains no starch and consists almost entirely of soluble carbohydrates with a very small proportion of proteins.

(4) Partially malted cereals, such as Allenbury's Food No. 3, Savory and Moore's Food and Benger's Food. Savory and Moore's Food contains malted diastase, while Benger's Food contains the pancreatic ferment by which the conversion of starch is further carried on when the food is mixed with warm fluid.

(5) Cereal foods in which there has been little or no conversion of starch.

It may be stated as a general rule that no food which contains starch should be used for an infant under seven months of age. Up to nine months only those foods in which the starch has been completely converted into soluble carbohydrates by malting or otherwise should be used for the infant. But the question of starch or no starch is not the only one to be considered. The proportion of fat present in the food as given to the infant is a matter of extreme importance, and in this respect most of the patent foods are deficient. The two principal diseases of infancy, rickets and scurvy, are due to deficiencies in proprietary foods. The vitamin deficiency should be covered by using preparations rich in vitamins A, C and D; and this is usually done by giving preparations of cod-liver oil and fresh fruit juice, for example, orange juice. Horlick's and Allenbury's Foods are specially useful where there is great difficulty in digesting the curd of fresh milk, so that a feeble infant or one whose digestive powers are impaired by an attack of gastro-enteritis may be given one of these foods for a few weeks. Any food containing only completely malted cereals should be used as an addition to milk.

An important fact to be remembered in infant feeding is that the suitability of a particular food for prolonged use cannot be judged by the mere fact that it is taken well and produces no immediate bad results. The evil effects of unsuitable foods may not be clear until the food has been continued for several weeks or months. Indeed, in the case of rickets or scurvy, the food may not give rise to any obvious digestive disturbances, but will ultimately produce these complications.

The Care of Premature Infants

All infants born before full term, that is, before the thirty-sixth to thirty-eighth week of pregnancy, may be considered as premature. The diagnosis of prematurity depends not only on the period of gestation when the child is born but its weight at birth. Children born before the thirty-sixth week of gestation and weighing less than $4\frac{1}{2}$ lbs. are to be treated as premature infants.

They require more elaborate care than children born at term. The points to be noted in the management of premature children are :—

- (1) The child should be kept warm and in a well-ventilated room.
- (2) Its skin should be properly protected.
- (3) Special care should be taken in feeding the baby, as not infrequently a premature infant is not able to suckle at the mother's breast.

To keep the child warm the body should be smeared with olive oil. It should not be bathed for three or four days after birth ; it should be wrapped in cotton-wool and kept either in an incubator or in a cot well protected and kept warm by hot-water bottles under the bed. Particular care should be taken to see that the temperature is uniform and that the hot-water bottles are not directly applied to the skin of the infant. When incubators are used the temperature in the incubator should be maintained at a uniform level of about 78° F. and there should be efficient ventilation possible within the incubator. In tropical countries an incubator is not necessary for the greater part of the year. It is well to keep the child in a protected cradle and in a room or verandah where sunlight is available. There should be no direct draught upon the child.

Clothing. The infant should be clothed warmly but not so as to impede its free movements or interfere with the process of respiration. No tight-fitting clothing about the chest, or abdomen should be encouraged. In some cases it is well to wrap the infant in cotton-wool ; the feet and hands should also be protected by flannel gloves or wrapped in small quantities of cotton-wool.

Feeds. A premature baby should be fed at regular intervals and in small quantities. If it can suckle at the mother's breast it is best to encourage it to do so at intervals of two hours. If, however, this is not possible, mother's milk must be drawn off with a breast pump into a sterilised flask or bottle and the infant carefully fed by means of a spoon or pipette.

The child should be disturbed as little as possible, yet frequent change of the napkin is necessary, so that the soiled linen may not be in contact with the tender skin.

Diseases of the New-Born

OPHTHALMIA NEONATORUM

This disease is most commonly due to infection of the eyes with gonococci during the passage of the head of the foetus through the vagina. Other organisms are occasionally the causative agents of ophthalmia, namely, streptococci, staphylococci, bacilli coli and bacillus diphtheria.

Clinical Features. About twenty-four to forty-eight hours after birth there is swelling of the eyelids and a yellowish watery discharge from the eye; the conjunctiva becomes inflamed and later a purulent exudate may be observed; the lids stick together and sometimes a considerable amount of pus may collect underneath them. The infection usually starts in one eye; and if care is not taken to prevent its spread, both eyes may be involved and may lead to severe ulceration and permanent loss of vision.

Prognosis. If treatment is taken in hand early the prognosis is good, but in neglected cases the prognosis is very grave as permanent blindness may result.

Treatment. Prophylaxis has been dealt with in connection with the care of the new-born. Once the actual infection has occurred, the treatment should consist of frequent washing of the conjunctival sac with mild boric lotion and the instillation of argyrol, 10 per cent., or a 1 per cent. solution of silver nitrate. When one eye is affected it is very important to protect the other by a Buller's shield. In severe cases it is better to seek the advice of an ophthalmic specialist. The use of Sulfapyridine in cases of ophthalmia has been a notable advance in recent years. It may be given by mouth and by local medication. Sulfapyridine is a specific against the *Gonococcus* and feebly active against the *Staphylococcus* and most of the other common organisms of ophthalmia neonatorum.

In some cases Penicillin may be used to avoid intolerance and resistance to sulfonamides, in the treatment of ophthalmia neonatorum. The total dosage may range from 60,000 to 300,000 units. Atropine drops and Boric acid irrigations may be used in the acute phase.

ICTERUS NEONATORUM

A slight amount of jaundice is not infrequent in new-born children. It appears usually on the third or fourth day after delivery and generally within the first week. It is seen first on the trunk and face, then on the extremities and conjunctivæ. In mild cases the urine and fæces remain normal and the child's health does not suffer in any way. The jaundice usually disappears within four or five days, or at the most within one or two weeks.

This is due to the destruction of the red cells, with the formation of an excess of bile pigment within the first few days after delivery.

There are, however, other causes of icterus in the new-born which do not result in such a mild degree of jaundice and which are often attended with signs and symptoms definitely pathological.

Among these may be mentioned the varieties of jaundice which are the result of inflammation, obstruction, severe sepsis and hæmolytic.

Catarrhal jaundice is due to some gastro-intestinal infection at birth. It may be due to the obstruction produced by inflammatory swelling of the mucous membrane of the biliary papillæ. The jaundice that results is more severe in form, the conjunctivæ tinged yellow, the urine is bile-stained and the stools are clay coloured. As a result of the enteritis some degree of diarrhoea may be present. It is not attended with any rise of temperature. It generally yields to simple remedies: a teaspoonful of castor-oil or $\frac{1}{4}$ gr. of hydrargyrum cum creta will probably clear the jaundice.

Obstructive Type. This is generally due to developmental defects in the bile-ducts. The resultant jaundice is very severe, and the condition is usually fatal.

The **septic type** results in a severe form of jaundice known as *icterus gravis*. It is generally due to septic infection of the umbilical stump. The organisms which gain admission through the stump soon find their way to the liver through the obliterated umbilical vein and give rise to bacteræmia. There is high fever, intense jaundice, clay-coloured stools, and almost invariably the disease ends fatally.

Familial Icterus Gravis Neonatorum. This is a rare variety of jaundice which affects children in the same family and begins within a few hours after birth. The child is drowsy and is not able to suckle at the breast. The stools are normal in colour. The urine is dark and contains the bile pigment. It ends fatally within a few days, the maximum period being three weeks. Cases are on record where recovery has taken place after injection of 15 c.c. of mother's blood into the infant's muscles daily for three or four days.

TETANUS NEONATORUM

This should be a very rare disease, but it is still not infrequent in tropical countries where skilled help at birth is not always available. It is almost always due to infection of the stump of the umbilical cord by the tetanus bacillus. The signs are those usually present in cases of tetanus in the adult—spasmodic rigidity of the muscles of the jaw, trunk and limbs, with difficulty in swallowing.

Prophylactic treatment is the best method of avoiding such a severe complication. Should, however, infection occur, large doses of anti-tetanic serum are indicated intrathecally.

INFANTILE CONVULSIONS

Convulsions in the neonatal period are not infrequent. Convulsions occurring within the first forty-eight hours after delivery

are generally due to some damage to the brain which has occurred during the course of delivery. A close scrutiny of the nature of delivery will probably make this clear. They are not infrequent in premature children delivered naturally. They are more common in cases of breech deliveries, particularly with premature infants and in cases of prolonged or difficult labours.

Among other causes may be mentioned:—

- (1) Asphyxia neonatorum.
- (2) Febrile conditions.
- (3) Gastro-intestinal disturbances.
- (4) Developmental errors such as encephalocele, hydrocephalus, microcephalus, etc.

Symptoms. Convulsions may occur without any previous warning. They may involve only the face and upper limbs or may be more generalised. In the severe type of convulsions the infant stops breathing, the face becomes blue and turgid and there is a spasmodic contraction of the muscles. Retraction of the head may occur. Convulsions are generally quite short in duration; they may occur again and again in severe cases and may occasionally end in a kind of status epilepticus.

Prognosis depends upon the cause. It is more serious in cases associated with cerebral injury and congenital anomalies.

Treatment. Immediate treatment to control the convulsions consists in loosening any clothing about the infant, drawing the tongue forward and placing the infant in a hot bath, with a cold compress on the head. If breathing has stopped temporarily, artificial respiration should be given. If the convulsions are frequent a few whiffs of chloroform may be indicated. Bromide and chloral should be administered per rectum to control the fits. It is better to combine the two drugs so as to obtain a more rapid effect. The drugs may also be given by mouth. By the rectum the dose may be about 1 to 2 grs. of chloral hydrate and 3 to 5 grs. of potassium bromide. By mouth, chloral $\frac{1}{2}$ gr. with 1 gr. of bromide may be given at intervals of three hours.

Prophylaxis consists in the care taken to prevent intracranial stress and possible injury in the course of delivery.

In cases due to febrile conditions the temperature should be kept below 102° and the cause treated. Where convulsions are due to gastro-intestinal causes, particularly constipation or diarrhoea, suitable remedies should be administered. Dietetic precautions are necessary in such cases.

CONGENITAL SYPHILIS

The part played by the mother in transmitting a syphilitic infection to her offspring has been dealt with in detail in the

chapter on diseases complicating pregnancy. It has been stated there that an infant may be born manifesting signs of syphilis, or it may at a latter date show evidence of the infection. The extent to which such manifestations occur depends on (1) the severity of the infection in the mother, (2) the time at which that infection occurred with reference to gestation, and (3) the efficiency of any treatment that the mother had during pregnancy.

Clinical Features. A syphilitic infant may show manifestations of the disease at birth. This generally is in the form of an eruption of bullæ or pustules on a dark red base. The skin eruptions may vary in their nature and generally occur within the first three months. They are usually over the napkin area, near the nose and mouth, on the palms of the hands and soles of the feet; they may sometimes occur over the whole trunk and extremities. Condylomata and moist papillæ and ulcerative fissures or rhagades may appear at the angles of the mouth. Simultaneously with the skin eruptions the nails may become opaque and irregular. The hair tends to fall out, but in some cases there may be an abundant growth of hair. Syphilitic infants tend to waste and become marasmic. The wasting is independent of any faulty feeding or irregularity of the bowels; and in infants who waste persistently in the absence of the ordinary causes of marasmus the possibility of congenital syphilis should be considered.

Snuffles is an important and early sign of congenital syphilis that can be easily recognised. It usually occurs within the first six weeks. The condition varies greatly in degree from a slight stuffiness of the nose to a profuse discharge of pus, sometimes blood-stained. If the snuffles continue for some time the bridge of the nose may become depressed, the cry may become hoarse and raucous. Suppurative otitis media is often an early manifestation.

When the disease has been present for some time the infant presents a typical picture with marasmus, snuffles, skin eruptions and other changes consequent thereon. In some cases tertiary lesions develop; they may appear very early or not till the child has grown up. Gummata, interstitial orchitis, tertiary lesions of the mouth and throat, interstitial keratitis, affections of the middle ear and changes in the teeth may all appear at a much later period. These manifestations may affect the bones and the viscera and finally the nervous system.

Diagnosis. The typical skin eruptions, snuffles, wasting, etc., constitute a clinical picture that arrests attention. The diagnosis

can be confirmed by the demonstration of the *spirochaetae pallida* in the secretions and by Wassermann reaction. If the Wassermann reaction of the mother's blood is positive, active treatment of the infant is called for.

Treatment. The proper time to undertake treatment with a view either to prevent or abort the attack in the infant is during pregnancy. If, however, this has not been done, or in cases where treatment has been given during pregnancy but has not been undertaken sufficiently early, it may be necessary to supplement it by antisyphilitic treatment of the new-born.

There are certain difficulties in the treatment of congenital syphilis, as the methods applicable to adults cannot be applied to children. Arsenical preparations have established their claim in the treatment of syphilis. The question arises whether the infant is to be treated by arsenical injections or by oral administration of iodides and mercury and inunction of mercury. Care has to be taken when injections are given. The ordinary compounds used are novarsenobillon, sulpharsenol, neokharsivan, etc. If injections are to be given it is preferable to give them intramuscularly into the glutei. The dose should not exceed 0.05 grm. if novarsenobillon is used. Sulpharsenol is given either intramuscularly or subcutaneously, the initial dose varying from 1 to 1.5 cgms. With these various methods of treatment by arsenical injections mercurial preparations are also given—inunctions are generally used for infants and grey powder and potassium iodide for older children.

If treatment by oral administration and inunction is decided upon, mercury is given in the form of hydrargyrum cum creta by mouth or as mercurial cream; it may be given intramuscularly in doses of $\frac{1}{4}$ to $\frac{1}{2}$ gr. according to age, or by inunction. Probably the most convenient and satisfactory method of administration is by inunction. The cream is rubbed into the abdomen, back, either axilla or either groin in turn, the place being changed daily so that there may be no irritation of the skin. This treatment must be continued for months. Bismuth injections are well tolerated and are usually preferable to the use of mercury, the dose being calculated according to age.

Combined with this antisyphilitic treatment, hygienic measures should be followed and the child carefully nourished. Occasionally diarrhoea may result when the antisyphilitic treatment will have to be stopped for some time and the usual lines adopted to check the intestinal irritation.

HÆMORRHAGE IN THE NEW-BORN

This may occur from a variety of causes. The bleeding may be :—

- (1) From the umbilical cord.
- (2) From the vagina.
- (3) From the bowels.
- (4) Hæmorrhagic manifestations of the skin.
- (5) Hæmorrhagic discharge from the nipples.

Hæmorrhage from the umbilical cord may occur either primarily or secondarily. Primary hæmorrhage is the result of faulty technique in the ligation of the cord and occurs within an hour after birth. It is to be controlled by applying a second ligature properly.

Secondary hæmorrhage is of more serious consequence. It is generally due to sepsis of the umbilical cord. In some cases the hæmorrhage may occur at the time of the separation of the umbilical cord. Not infrequently jaundice is also present due to the same ætiological factor.

The prognosis is grave. Treatment should aim at controlling the hæmorrhage and dealing with the primary cause. To stop the hæmorrhage the umbilicus should be transfixed by two needles inserted at right angles and a purse-string suture put all round and tightened over the umbilical stump. Injections of hemoplastin are desirable, and small doses of calcium may be administered in the milk. For the sepsis, sulphanilamide preparations should be used.

Hæmorrhage from the vagina. This is of comparative insignificance, as generally it occurs in small quantities within the first few days of life. It is possible that this is due to an excess of maternal œstrin circulating in the infant's blood. It generally passes off in a day or two and requires no special treatment.

Hæmorrhage from the bowels: melæna neonatorum. This is a serious complication and occurs more frequently in children with congenital syphilis. Melæna most commonly starts on the second or third day after birth. The motions are usually large and copious, brownish-black in colour and occasionally may contain bright blood. The infant may also vomit blood. Sometimes convulsions may set in; the infant gradually becomes pale, becomes collapsed and may die.

The prognosis is always grave; recovery may take place if the loss of blood is only through the bowels and in small quantities.

Treatment consists in giving injections of 5 to 10 c.c. of whole blood from the mother into the gluteal region of the infant. It may be repeated once or twice in the day, or small doses of hemoplastin may also be given. Nourishment should be restricted, the infant being fed on glucose water. Subcutaneous saline is necessary to revive the child.

Hæmorrhages in the skin. Occasionally purpuric rashes may appear in the skin. These may be due to severe septic infection or to a hæmorrhagic diathesis. The disease always ends fatally.

Hæmorrhagic discharge from the breast. Occasionally slightly blood-stained fluid may be expressed from one or other of the nipples. It is not generally of any clinical significance. It is best to clean the nipples, and where there is engorgement or inflammation, to apply hot compresses three or four times a day for a few days. Calcium lactate in small doses of 1 to 2 grs. may be given in milk three or four times a day. The general nutrition of the infant should be carefully looked after.

Vitamin K Therapy. The value of Vitamin K therapy in hæmorrhagic diseases of the new born and as a prophylactic is still under trial. Still it is wise to use it in cases of prolonged labour, in those giving birth to twins or a single premature baby, in cases of abruptio placenta or placenta prævia and in cases of difficult labour. It may also be useful to give Vitamin K hypodermically immediately after birth to the babies of such mothers.

SECTION V

PATHOLOGY OF PREGNANCY

CHAPTER XVI

TOXÆMIAS OF PREGNANCY

UNDER this heading are grouped a number of diseases which not infrequently occur during the course of pregnancy, wherein certain toxins or poisons are supposed to be present in the blood-stream causing pathological changes in various organs. The exact nature of the toxins and the mode of their origin are still shrouded in mystery, and numerous and varied are the theories that have been advanced to explain these toxæmias. We shall refer to these theories when dealing with eclampsia, but we may state here that although in a perfectly healthy woman the different organs should adjust themselves to the increasing needs of the foetus *in utero*, the metabolic processes may easily become altered so that the system fails to adjust itself to the varying needs of the growing ovum and the mother. Certain predisposing factors may lead to the onset of pathological changes which, once they appear, may progress unless they are diagnosed early and suitable measures adopted. It is for this reason that considerable emphasis has been laid upon the hygiene of pregnancy. It may be stated as a general rule that careful attention to the hygiene of pregnancy does in the large majority of cases prevent the possible onset of toxæmia.

Varieties. The milder forms of toxæmia may present exaggerations of some of the symptoms of pregnancy, such as nausea, vomiting, etc. In other cases they may show themselves as minor complaints in pregnancy and affect various systems, such as the digestive, circulatory, respiratory, urinary systems and the skin. Among the minor complaints may be mentioned pruritis, urticaria, palpitation, varicose veins, enlarged thyroid, mild degrees of anæmia, etc.

The more severe forms of toxæmia of pregnancy may be classified under the following headings:—

- (1) Hyperemesis gravidarum.
- (2) Acute yellow atrophy of the liver.
- (3) Pre-eclamptic toxæmia or pregnancy kidney.
- (4) Eclampsia.
- (5) Essential Hypertension.
- (6) Concealed accidental hæmorrhage.

HYPEREMESIS GRAVIDARUM

Nausea and vomiting are symptoms that occur in the majority of pregnant women during the early weeks of pregnancy. Ordinarily they begin about the sixth week and gradually subside after the twelfth week. In some cases they may persist for a longer period, up to the sixteenth or twentieth week, but do not give rise to any serious impairment of the health of the patient. Very rarely this may continue throughout the course of pregnancy, the patient vomiting once or twice in the morning, but later in the day feeling comfortable enough to retain nourishment, thus keeping up her strength.

Hyperemesis, on the other hand, is the condition where the vomiting becomes obstinate and uncontrollable and occurs much more frequently, sometimes lasting throughout the day, so that the patient is hardly able to retain anything. Eventually the general health of the patient suffers and signs of dehydration with loss of weight appear.

Ætiology. The ætiology of this particular form of toxæmia also is not clear. There are certain conditions which may favour the occurrence of hyperemesis, and on this basis two types are recognised:—

- (1) Neurotic, and
- (2) Toxic.

The *neurotic* type of hyperemesis is more common among women of an emotional temperament and is accentuated by domestic or other worries. In some cases there may be a reflex factor involved, such as retroversion of the gravid uterus, erosion of the cervix, pelvic inflammations, hydatidiform mole.

In the *toxic* form, which constitutes the majority of cases of hyperemesis of the severer degree, changes take place in the liver, kidneys, stomach and blood. These cannot be all explained on the basis of want of nourishment and dehydration. What the particular nature of the toxin is and where it is formed are subjects still open for discussion. It is possible that abnormal function of one or other of the endocrine glands may be responsible in some cases. On the other hand, the theory has been advanced that the toxæmia is of intestinal origin, and these toxins circulating in the blood cause the pathological changes in the organs already enumerated. Why toxæmia should produce vomiting in some cases and lead to other manifestations in others is a matter still under discussion.

In some cases of the neurotic type, severe vomiting may occur resulting in the development of the toxic type. The lack of nourishment with dehydration may result in changes in the liver

with the glycogen store depleted, resulting in necrosis and fatty degeneration. The impaired function of the liver results in deficient detoxication and a vicious circle is thus produced, which leads to further changes in the kidneys, stomach, liver and even the intestines.

Deficient carbohydrate intake may result in imperfect combustion of fats, leading to acidosis which may cause increased vomiting.

Lastly, it must be borne in mind that there are other conditions which may cause vomiting in the pregnant woman, just as they would in the non-gravid, such as gastric ulceration, carcinoma, appendicitis, uræmia, etc.

In the severe cases which end fatally, lesions are usually found in the liver and kidneys. Central necrosis of the lobules of the liver and degenerative changes in the convoluted tubules of the kidney may be present. The glomeruli are generally little affected. The heart undergoes fatty degeneration.

Signs and Symptoms. The chief symptom is the increased vomiting associated with a constant feeling of nausea. Anorexia supervenes and gradually the character of the vomit changes, so that not only undigested food, but mucus with streaks of blood and tinged with bile, may be present. After a time the patient gradually becomes emaciated; the skin is dry, inelastic and wrinkled; the eyes are sunken; the tongue becomes dry, cracked and there may be a fetid odour in the breath. The urine may be markedly diminished in quantity and albumin with renal casts may be present. When the toxæmia is more pronounced, acetone and diacetic acid may be present, and occasionally bile. In some cases of a more acute nature, where the vomiting is very severe, associated with a great deal of retching, the vomit may be of a coffee-ground colour. Retching may be the most important symptom, and little or no vomit may occur, except slight blood-stained mucoid material. The patient now is restless, irritable, the pulse increased in frequency, the blood pressure is low and, in the later stages, jaundice may develop and the breath may smell of acetone. Gradually she sinks, becomes unconscious, develops a low muttering delirium, with a slight increase in temperature, and ultimately she passes into coma and death supervenes.

Recently certain characteristic eye changes have been described in cases of severe toxic variety of hyperemesis; the changes varying from slight dimness of vision without any noticeable changes in the retina to optic neurites with a central defect or even retinal hæmorrhages radiating from the disc without vascular changes or exudates. These are ascribed to deficiency of Vit. B₁ and possibly to Vit. C. Presence of papilloedema or retinal hæmorrhages is an indication for termination of pregnancy.

Diagnosis. Two factors have to be first determined in the diagnosis of this condition:—

- (1) The existence of pregnancy.
- (2) The absence of any other pathological condition which may cause vomiting.

The diagnosis of pregnancy depends upon the presumptive signs and symptoms at this stage, such as amenorrhœa, changes in the breasts, softening of the cervix, Hegar's sign, and as none of these have a positive value, the diagnosis can only be clinched by performing the Aschheim-Zondek or Friedman's tests.

The conditions which may cause vomiting apart from pregnancy must be borne in mind, and a careful investigation made with a view to exclude such causes as gastric or duodenal ulcer, appendicitis, etc.

Attempts have been made to determine the particular type of vomiting, whether it is toxic or neurotic, and also to estimate the seriousness of the condition by various laboratory tests. Estimation of the ammonia coefficient, of the blood chloride etc., has been made; but so far no definite conclusive findings have been reached which can aid in the diagnosis or prognosis of the condition. It may, however, be said that a case should be presumed to be of the severe type, if in spite of treatment the vomiting persists and the patient's condition steadily deteriorates, she loses weight, the pulse-rate increases in rapidity, fever sets in, the vomiting becomes coffee-ground, jaundice appears and coma or delirium occurs. A fall in blood pressure and the appearance of bile and albumin in the urine are unfavourable signs.

Prognosis. In the majority of cases the hyperemesis is of the neurotic type, and if taken in hand early and treated with care the prognosis is good.

In the toxæmic variety the prognosis is less favourable, and if there has been delay in the interruption of pregnancy till the woman has become very emaciated and semi-conscious, the prognosis is definitely grave.

Favourable factors in prognosis are:—

- (1) Cessation of vomiting. This, by itself, is not a sign that the woman is actually out of danger, but must be taken along with the improvement of the patient's general condition.
- (2) Increase in the quantity of urine. This is evidence that the patient is able to retain fluids and that the circulation through the kidneys is effective and the damage is not serious.
- (3) A slow pulse of good volume and regularity.
- (4) A clean, moist tongue, which proves that the intestinal tract is functioning properly.

(5) Absence of jaundice. This does not mean that the patient is entirely free from danger, although its presence is definitely of bad prognostic significance.

(6) A normal blood pressure. A fall in blood pressure is evidence of cardiac failure due to toxic myocarditis.

(7) Normal temperature. This may not carry much significance, as in some cases the temperature may not rise. However, an elevated temperature or a subnormal one is indicative of a bad prognosis.

(8) Absence of bile and albumin in the urine. While albumin may not necessarily appear in cases of hyperemesis, its presence in the urine is a bad sign and so is the presence of bile.

(9) Ocular changes. The absence of these may be of no significance; but their presence is definitely indicative of a serious state of affairs, which may necessitate the termination of pregnancy.

Treatment. In the treatment of this condition the following points should be borne in mind:—

(1) Isolation of the patient, preferably in an institution, or at least away from familiar surroundings and from personal contact with near relatives.

(2) Correction of the associated lesions such as retrodisplacement of the uterus, erosion of the cervix etc.

(3) Dietetic measures:

(a) An adequate supply of easily assimilable diet with a high carbohydrate content.

(b) Reduction of proteins to the irreducible minimum.

(c) The avoidance of all fatty foodstuffs so as to reduce the chances of acidosis.

(4) An increase in the quantity of fluid taken by the patient to ensure free diuresis and to supply fluid for the dehydrated tissues.

(5) To keep the bowels free so as to minimise the chances of toxic absorption from the intestines.

(6) Sedatives so as to reduce the irritability of the stomach and of the nervous system.

For purposes of treatment, cases of hyperemesis gravidarum may be considered under three groups—mild, moderate and severe.

In the *mild cases* there is an exaggeration of the symptom of morning sickness, and often these patients require nothing more than to be given a definite plan to follow in regard to intake of foods and avoidance of rich protein and fatty foodstuffs, with

proper attention to bowels. Any reflex factors responsible, such as erosion of the cervix, displacements of the uterus, etc., should be attended to. It is well to assure the patient that the condition is amenable to treatment and it is here more than anywhere else that the psychic factor plays its part and the confidence that the physician is able to inspire is largely responsible for the cure of the condition. Occasionally, brilliant results are reported through the administration of certain drugs, but in the majority of cases the important factor in the cure of the condition is the underlying psychic factor.

Moderate Cases. In these cases the patient suffers from the effects of the hyperemesis and may show signs of starvation, dehydration and of changes in the liver. The urine may be diminished in quantity and may contain acetone. In such cases it is best to isolate her preferably in a hospital or in a nursing home. Complete rest in bed is essential. As far as possible all nourishment should be given per rectum. The bowels should be attended to every morning by giving a large soap and water enema or a bowel wash, followed by nutrient enemata of 6-8 ozs. of 10% glucose solution at intervals of 4 hours during the day. Drinks of fruit juice, sips of water or glucose and water should be given at intervals of three hours and in small quantities only at a time, total quantity being about three pints per day. It is well, however, to avoid all nourishment by mouth for a day or two. Sedatives are indicated. Bromides may be given per rectum; 30 grains of potassium bromide or 10 grains each of the triple bromides, potassium, sodium and ammonium, may be added to the nutrient enema given at bedtime.

If in spite of this the patient fails to improve or becomes worse, more radical methods of treatment, to be outlined later, may have to be adopted. Particular care should be taken to watch for any of the signs and symptoms suggestive of an aggravation of this condition, such as jaundice, albuminuria, serious diminution in the quantity of urine, etc.; and if such signs manifest themselves the need for termination of pregnancy must be considered.

Of the many drugs that have been used in the treatment of this condition may be mentioned cerium oxalate, given in doses of 3 to 5 grains four to six times a day; corpus luteum extract given by injection; thyroid, Lugol's iodine, bismuth, dilute hydrocyanic acid, cocaine, etc. Preparations of calcium have been used with benefit in some cases. Calcium gluconate, 5 c.c. of a 10 per cent solution, can be given daily, intramuscularly, for a few days. Preparation of B₁, B₆, such as Benerva, Berin, etc., are found to be extremely useful in these cases when given in large doses intramuscularly.

When the vomiting has ceased the diet of the patient should be carefully increased till she can take her normal diet. This is done slowly beginning with toast and biscuits increasing to bland carbohydrates with little of fats and proteins. The quantity and quality should be increased gradually till the patient takes her usual diet without discomfort in a week's time after cessation of vomiting.

In some cases where erosion of the cervix is present, cocainisation of the cervix by touching it up once or twice a day with a 5 to 10 per cent. solution of cocaine is occasionally beneficial.

The replacement of a displaced gravid uterus has already been referred to as a factor in the treatment of some cases.

Severe Cases. The majority of cases generally improve on the above lines of treatment. When, however, such treatment fails and the disease takes a severe turn, the condition of the patient rapidly deteriorates. The clinical features of a severe type of hyperemesis are: the vomiting is extremely severe and lasts the whole day, sometimes becoming coffee-ground; jaundice may supervene; the pulse becomes rapid; the skin dry; eyes sunken; abdomen scaphoid; patient is irritable; complains of thirst; the urine is very much diminished and may contain albumin, acetone bodies and casts.

When the diagnosis of a severe type of hyperemesis is made, the patient should be isolated, preferably in a hospital, so that there may be the fullest control over her and her environment. A definite plan of treatment should be adopted, carefully watching the progress from day to day. Careful nursing by one who understands the general principles involved and keeps a firm and efficient control over the patient, at the same time gaining her confidence, will go a great way towards improving the condition of the patient.

The associated factors, such as cervicitis or a retroversion, should be attended to; the bowels should be thoroughly cleansed by means of large enemata, and for the first twenty-four to forty-eight hours all nourishment by mouth should be stopped. The mouth and teeth should be kept clean. To combat dehydration it is necessary to give fluids by other methods. Proctoclysis or saline per rectum must claim our first attention. In the more severe cases, however, it may be necessary to give an injection of glucose by the intravenous method; in some cases saline can be given subcutaneously. About a litre of 5 per cent. glucose in saline may be given at a time by the intravenous route, preferably

by the drip method through a cannula introduced into the saphenous vein just over the internal malleolus. Vit. B therapy is very useful in these cases and preparations such as Benerva may be given in large doses intramuscularly. It is preferable to combine these methods with proctoclysis. Sedatives should be administered to give rest and favour sleep. Bromides, 30 to 45 grains, may be dissolved in 6 to 8 ozs. of fluid and given per rectum gradually. Occasionally chloral hydrate may be substituted for the bromides.

Amongst the drugs that are sometimes given by injection, besides the glucose solution already referred to, are calcium gluconate, 10 c.c. of a 5 per cent. solution. The use of insulin has been advocated on the ground that the acidosis in severe cases of vomiting is due to deficient utilisation of carbohydrates, and that insulin, as in cases of diabetes, will help in carbohydrate metabolism and thus prevent acidosis. It is advised that insulin 10 to 15 units should be given with dextrose in the proportion of 10 grams of dextrose for each unit of insulin.

In spite of this treatment improvement may not occur, and the patient may progressively become worse. If, therefore, in spite of this treatment, improvement does not occur, vomiting persists, evidence of starvation and dehydration is present, the skin is dry and pulse-rate remains high, or if temperature rises or jaundice intervenes, interruption of pregnancy must be considered.

The indications for terminating pregnancy in cases of hyperemesis gravidarum are:—

- (1) Improvement does not occur after careful treatment on the lines suggested, and the patient becomes gradually weaker.
- (2) The pulse is constantly high, above 120, or the temperature rises above 100° F.
- (3) Serious diminution in the quantity of urine excreted or persistent albuminuria.
- (4) The occurrence of jaundice or the presence of bile in the urine.
- (5) Persistently low blood pressure.
- (6) Retinal changes, particularly albuminuric or hæmorrhagic retinitis.

One important point to bear in mind is that therapeutic abortion should never be delayed till the patient has become so intensely toxic that response to treatment after interruption is not possible. The stage of low muttering delirium and coma must never be allowed to occur before termination is decided upon.

judgment is necessary to determine the optimum time of pregnancy ; but on the whole it is safer to operate rather than to wait in the vain hope that the patient will later recover.

When employed to empty the uterus must ensure a minimum of shock to the patient and reduce to the smallest risk of sepsis. When operation is indicated the patient is already low so that she is very liable to shock by the method which produces a severe strain by prolonged emptying of the uterus also adds to the risk. It may, however, be mentioned that though the uterus is later emptied, if the ovum dies *in utero* relief is almost immediately noticeable.

In the third trimester of pregnancy there are two methods possible to dilate the cervix and evacuate the uterus with the finger or the blunt curette. This may be done in one or two stages. We personally prefer to dilate and stir up the contents of the uterus, thereafter to evacuate, only giving a small dose of pituitary extract. Twenty-four hours later the woman may abort. The cervix may be sufficiently dilated to permit removal of the dead ovum. An alternative method of treatment is hysterotomy preferably by the abdominal anaesthesia.

By the fifth week the products of conception attain a size which makes it increasingly difficult for thorough evacuation by the vaginal route by ordinary methods of dilatation. In such circumstances it is safer to employ abdominal hysterotomy which can be done under local anaesthesia and is free from shock and no chance of sepsis.

Following operation by any of these methods, the patient should be kept in bed, intravenously and saline per rectum and treatment adopted should be continued.

It has been raised whether in subsequent pregnancies hyperemesis may not recur, and because of this possibility, it is reasonable to consider the advisability of sterilisation. In some cases where, with each pregnancy, the women suffer from a more or less severe type of hyperemesis ; but in the large majority of cases it does not follow that sterilisation is not justified.

THE YELLOW ATROPHY OF THE LIVER

A very rare and fatal complication in which jaundice, and other symptoms arise associated with diminution

in the size of the liver and necrosis of the liver cells. Pregnancy is one of the chief exciting causes, but the disease may also occur in the non-gravid from conditions which cause an acute toxic and infective hepatitis, for instance, alcohol, chloroform and phosphorus poisoning, secondary syphilis, typhoid fever and influenza. It may occur during any period of pregnancy, during labour, or in the puerperium.

Pathology. The condition is caused by a very acute necrosis of the liver cells, the intercellular ferments of which are set free and produce autolysis. If the disease ends fatally within two or three days the liver may be found enlarged and yellow, but if death occurs after a week the liver shrinks to a half or third of the normal size. The surface is smooth and the capsule loose and wrinkled. Hæmorrhages may sometimes be found under the capsule; associated changes may be found in some of the other organs such as the heart, the muscles and the glands of the digestive tract which may be undergoing fatty degeneration. The kidneys undergo severe changes, particularly involving the convoluted tubules, which may be found degenerated. The spleen may be enlarged and soft.

Symptoms. In the *first stage* jaundice is present with fever, malaise and vomiting. This stage may in some cases last for five or six days.

In the *second stage* of the disease, when the liver fails to function, drowsiness, headache, photophobia, restlessness and delirium, with characteristic maniacal shrieking, may be present. Muscular twitchings and occasionally convulsions may follow and the patient becomes violent. The pupils may be dilated; there may be an extensor plantar reflex. Retraction of the head may be present, suggesting meningitis. The vomiting may be severe; the tongue is dry and tremulous; the pulse becomes rapid and feeble; the temperature is subnormal; hæmorrhages may occur from the gums, nose, kidneys, alimentary canal and uterus. Coma finally develops with Cheyne-Stokes' breathing, and the patient may eventually die after the disease has lasted in this stage for three to four days.

In the first stage the liver is often enlarged and tender, but later it rapidly shrinks and in some cases hepatic dullness may not be elicited at all, the intestines getting in between the shrunken and flabby liver and the abdominal wall. A moderate leucocytosis may be present. The urine is diminished, high coloured, contains albumin, casts, bile and blood. Rounded discs of leucin and needle-shaped crystals of tyrosine derived from autolysis of the liver cells may be found in the urine. Leucin and tyrosine, however, may

be found in other conditions such as typhoid fever, erysipelas and leukæmia, so that their presence is not pathognomonic of acute yellow atrophy.

Diagnosis. The diagnosis of this condition depends upon:—

- (1) Jaundice—which should always arouse suspicion in a pregnant woman.
- (2) The severe constitutional symptoms.
- (3) Diminution of liver dullness.

An examination of the urine may also be of help.

Prognosis. Is very bad for both mother and child; the child always dies *in utero*. Occasionally a case is reported as having survived, but such reports have always been challenged on grounds of mistaken diagnosis.

Treatment. It is obvious that very little can be done by way of treatment in such a rapidly fatal disease. Treatment is largely symptomatic. In the early stages of the disease the diet should consist of carbohydrates only and large quantities of fluids. If there is much vomiting glucose and saline, per rectum and subcutaneously, or intravenously should be given. Large quantities of sodium bicarbonate may be required to counteract the acid intoxication. Intravenous injections of 10 to 20 per cent. dextrose solution with small doses of insulin, as in cases of hyperemesis, have been tried.

The question of termination of pregnancy should be considered whenever the diagnosis has been made, unless the patient is so ill that interference might precipitate the end. Abdominal hysterotomy should be the operation of choice under local anæsthesia.

PRE-ECLAMPTIC TOXÆMIA

By this term is meant the condition which sometimes occurs in pregnant women, characterised by certain signs and symptoms chief of which being rise in blood pressure, albuminuria and oedema which, if not properly treated, may eventually lead to convulsions, a condition then termed eclampsia. The term albuminuria of pregnancy is also applied to this condition; but inasmuch as albuminuria may occur in other conditions and need not necessarily be one of the signs of pre-eclamptic toxæmia, it is desirable to use the term *pre-eclamptic toxæmia* for the symptom-complex which generally precedes the onset of true eclampsia.

The term *pre-eclampsia* is sometimes used to denote the condition which is the immediate precursor of eclampsia and which will almost inevitably end in the occurrence of eclampsia, unless adequately treated. It can therefore be said to be an extreme

degree of pre-eclamptic toxæmia and is fortunately not so frequent, except in neglected cases.

Another term commonly used in relation to this particular type of toxæmia is *eclampsism*. In this condition the signs and symptoms of pre-eclampsia are manifest, but the patient goes into a condition of coma without actual convulsions developing.

Pre-eclamptic toxæmia is more frequent in primigravidae than in those who have borne several children, and usually develops during the last trimester of pregnancy. Occasionally, however, it has been known to occur even as early as the twentieth week of pregnancy.

Signs and Symptoms. The onset of pre-eclamptic toxæmia is usually insidious. Generally it gives rise to definite signs and symptoms, which either in combination or as individual signs or symptoms must always arrest the attention of the obstetrician to the possibility of toxæmia.

The chief signs and symptoms of pre-eclamptic toxæmia are:—

(1) *A Rise in Blood Pressure.* Ordinarily the blood pressure is between 110 and 120 mm. of mercury systolic and 70–80 mm. diastolic. If it is above 130 systolic or 85 diastolic it must always arouse suspicion, and blood pressure readings above 140 mm. of mercury systolic or 90 mm. diastolic are definitely suggestive of toxæmia. The blood pressure may exist in association with other signs to be described later; or occasionally it may be the only sign and is usually the earliest. The importance of taking blood pressure readings, therefore, in all pregnant women particularly after the twenty-fourth week cannot be over-emphasised.

(2) *Albuminuria.* In association with a rise in blood pressure, or occasionally without any marked rise, albuminuria may occur. Albuminuria may be very slight or may be so marked that the urine solidifies on boiling. Albuminuria need not, however, be present in all cases, and even in some of those cases which later develop eclampsia the absence of albumin has been noticed. In the majority of cases, however, albuminuria is a fairly constant sign. In association with albuminuria there may be a diminution in the quantity of urine. The amount of albumin in the urine is generally a measure of the severity of the toxæmia. In addition to albumin there may be casts, hyaline, epithelial and granular; red cells and pus cells may also be present in the urine.

(3) *Œdema.* Œdema of varying degree and extent is fairly constant in pre-eclamptic toxæmia. It first occurs in the lower extremities and may be more evident in the evening, disappearing after rest. Œdema is significant if it is bilateral: When œdema is more generalised it involves the hands, arms, face, the labia and lower abdomen.

Oedema may, however, occur in various other conditions, such as the more severe degrees of anæmia and in some cases of hypovitaminosis and cardiac complications. Occasionally unilateral oedema may occur in the later weeks of pregnancy due to relatively increased pressure of the presenting part on one side of the pelvis.

(4) *Increase in Weight.* A rapid and excessive gain in weight is the earliest indication of pre-eclamptic toxæmia. It is due to the retention of fluid in the tissues. Especially during the third trimester it is an important indication of pre-eclamptic toxæmia, even in the absence of hypertension, albuminuria or visible oedema.

It is a wise precaution, therefore, to weigh every pregnant woman at intervals of a week or at least a fortnight in the last sixteen weeks of pregnancy. A gain in weight of more than 5 lbs. in any month or a total gain of over 20 lbs. during the whole period of pregnancy should suggest the possibility of toxæmia.

These signs are associated in the more severe form of the disease known as pre-eclampsia with definite symptoms, such as headache, dizziness, dimness of vision, photophobia, epigastric pain, nausea and vomiting.

These symptoms may gradually or sometimes rapidly increase in severity, and if left untreated result in the onset of eclampsia. It should not be presumed that all the signs, or even the majority of them, should necessarily be present. In some cases perhaps one or two of the signs and symptoms appear, but the patient is not aware of their existence before actual convulsions set in. Hence the necessity of periodic examination of the pregnant woman at an antenatal clinic whether she complains of any symptoms or not.

The chief signs to note are the blood pressure, increase in weight, the presence of albumin in the urine and oedema. Among the symptoms a careful watch must be kept over headache, disturbances of vision, epigastric pain and a sense of constriction round the chest.

Prognosis. If recognised early and treated promptly the majority of cases end satisfactorily. In some, however, it must be confessed that no matter what method of treatment is used eclampsia develops. In others again the only possibility of saving the patient is by the termination of pregnancy, irrespective of the period of gestation. The prognosis must be considered both from the immediate and remote points of view. The immediate outlook is, in the majority of cases, favourable; the remote or ultimate prognosis depends upon the duration of the signs and symptoms before there is response to treatment. It is now well recognised that if hypertension or albuminuria be allowed to continue for a

long period, e.g. over ten days, the possibility is that permanent damage to the kidney may result, the extent of the damage being in proportion to the length of such a period. But in the majority of cases the kidneys whose functions have been deranged as a result of pre-eclamptic toxæmia, regain their normal state, though this may sometimes be delayed up to four months or longer after delivery. Some patients develop chronic-hypertension, particularly those who had a B.P. above 140 mm. systolic for over a month before delivery. Toxæmia has been noted in two or three subsequent pregnancies; this has been interpreted by different observers as *occult nephritis* or *recurrent toxæmia*. Occult nephritis is the condition where the patient is apparently healthy during normal periods but develops albuminuria or other signs of toxæmia when she becomes pregnant. Recurrent toxæmia on the other hand is the condition where, due to some factor probably associated with damage to the placenta, the toxæmic manifestations present themselves in repeated pregnancies. Recently the occurrence of abortion, premature labour, accidental hæmorrhage or pre-eclampsia in a subsequent pregnancy has been noted in patients who were the subjects of severe pre-eclampsia before. To avoid such complications which may be either immediate or remote sequelæ the termination of pregnancy at the proper time is of great importance.

The prognosis for the foetus is unfavourable. In the majority of cases premature labour may set in, or if the toxæmia is pronounced or persistent, the foetus may die *in utero*. In others again the treatment by induction of premature labour is unfavourable to the foetus. The prognosis also depends upon the severity of the toxæmia.

Treatment. *Prophylactic.* The condition yields to treatment generally, provided the diagnosis is made at an early date. Every pregnant woman should therefore be thoroughly examined from as early a stage of pregnancy as possible—certainly from the sixteenth week onward. At each examination, which must be at fairly frequent intervals, certainly not longer than a fortnight before the thirty-second week and at weekly intervals subsequent to that, the blood pressure and weight should be recorded and the urine examined for the presence of albumin. If cedema is noted the patient should be searchingly questioned as to the presence of other possible symptoms, and should be warned that if any of such symptoms should develop she must immediately report herself at the antenatal centre or consult an obstetrician.

Care must be taken to regulate the diet of pregnant women, so that it consists largely of fruit, vegetables, milk and carbohydrates, while fats and proteins are reduced to the minimum.

Rich spicy foods should generally be avoided. The gain in weight should be noted, and as has been stated already it is unfavourable if it is rapid and if over 20 lbs. The total quantity of urine passed should be recorded daily. A mild form of exercise is beneficial and a warm or tepid bath is invaluable. Care must be taken to see that the bowels are well regulated; laxatives may have to be given. It is advisable to give the patient a dose of castor-oil ($\frac{1}{2}$ oz.) at intervals of a fortnight. If cedema is present the quantity of fluids taken should be restricted. The diet should be such as will contain an adequate supply of vitamins, and this is generally obtained by taking milk, vegetables, fruit, etc. The intake of salt should be reduced to a minimum, and it is inadvisable to take any tea, coffee or alcoholic drinks.

Curative Treatment. If in spite of this regimen, the symptoms and signs of pre-eclampsia appear, it is better that the patient be put to bed, preferably in an institution. The blood pressure both systolic and diastolic should be systematically recorded every four hours, the total quantity of urine passed in twenty-four hours estimated, and the albumin content noted from day to day. Biochemical investigations of the blood are helpful in determining whether there is increased retention of non-protein nitrogen or urea, and for the estimation of chlorides if cedema is present. It is also desirable to examine the retina for signs of albuminuric retinitis.

When the pre-eclamptic toxæmia is of moderate severity the diet should be strictly limited. A milk diet is desirable and the total quantity of milk allowed daily should be limited to two to three pints. In the very severe type of case, starvation is the better method of treatment, at least for forty-eight hours, the patient being given occasional drinks of glucose, barley water, mineral waters and fruit juice, the quantity of intake of fluids being restricted to an amount less than the quantity of urine passed.

The bowels should be kept free by saline purgatives. Sedatives are of use in promoting sleep and relieving restlessness, bromides in doses of 60 grains by mouth or 100 to 150 grains per rectum daily, in association with chloral hydras 20 to 30 grains. It is not desirable to keep the patient on a strict diet over any prolonged period, as she may be unduly weakened and other complications may set in.

In some of the more severe types of pre-eclamptic toxæmia, 20 c.c. of a 10 per cent. solution of magnesium sulphate, intramuscularly, or 10 to 15 c.c. of a 25 per cent. solution intramuscularly, have been used with good results. It is preferable to adopt the intramuscular route, as the intravenous method of administration has produced alarming symptoms in some cases,

Intravenous injections of 25 c.c. of 25 per cent. solution of glucose have been used in certain cases with benefit. If from the irritability of the nervous system oedema of the brain is suspected, intravenous injection of glucose is useful. The effect of using glucose or calcium gluconate is to produce prompt diuresis, with diminution of oedema, a reduction in weight and in blood pressure.

If in spite of all these measures the signs and symptoms do not abate, one must inevitably face the question of terminating pregnancy. If the systolic blood pressure remains above 160 mm. or diastolic above 100, if retinal signs manifest themselves, if persistent headache, visual disturbances and epigastric pain are present, and if associated with these there be restlessness, sleeplessness, mental and muscular irritability, it is obvious that the patient is likely at any time to develop the more serious condition of eclampsia. In such cases, pregnancy must be terminated.

The question of foetal mortality and the possibilities of survival of the foetus have necessarily to be borne in mind. If the pregnancy is terminated earlier than the thirty-fourth week the chances are very poor for the foetus to survive. At the same time, it must be clearly realised that the chances of its survival are equally poor if the toxæmia is allowed to continue while the risk to the mother is increased. It would therefore appear to be safer not to risk the lives of both mother and foetus in a vain attempt to save the child, but to terminate pregnancy when inevitable for the sake of the mother.

The method of termination of pregnancy is a matter of some importance. Any method of forced delivery is to be deprecated and the greatest care should be taken to ensure asepsis. Apart from the shock involved in rapid methods of delivery, the chances of infection are greater in toxæmia, and one must therefore be careful in choosing the method of termination and in the technique thereof.

Medicinal methods of induction of labour are not always successful if adopted earlier than the thirty-sixth week. Even at a later stage they have to be repeated; and in the more severe forms of toxæmia there may not be enough time to repeat such methods of induction. It is not therefore, suitable for this condition.

A method of induction of labour which can be adopted in these cases with safety is puncture of the membranes low down. We have for some time invariably adopted this method with uniformly good results. Labour starts within twelve to twenty-four hours and the duration of labour is not prolonged. Another point that has been noted is that in cases where the membranes are ruptured high up, the duration of labour is longer than in cases where they are ruptured at the most dependent part.

Another method that may sometimes be adopted is separating the membranes from the uterine wall by the passage of two or three gum elastic bougies (Krause's method). Strict aseptic precautions must be taken, and generally labour sets in within twelve to twenty-four hours after the insertion of the bougies.

In recent years, owing to the uncertainties and the delay in the onset of labour by any of the methods suggested above, there is a tendency to resort to Cæsarean section for the termination of pregnancy in severe cases of pre-eclamptic toxæmia. This, however, is not desirable except in those rare cases where other indications such as cephalo-pelvic disproportion, abruptio placenta, tumours, etc., are present in association with pre-eclamptic toxæmia. Cæsarean section may be done either by the abdominal or vaginal route. The majority of obstetricians would perhaps prefer the abdominal route; but in some selected cases, as in multiparæ with a history of previous normal labours or with a premature fœtus, the vaginal route may be found suitable.

Termination of pregnancy is indicated for two reasons: to prevent the possible onset of eclampsia and the development of occult nephritis at a later date. Termination of pregnancy should not be delayed till a late stage, as under such circumstances it may not be possible to prevent the onset of eclampsia; and in the more chronic and severe forms the delay may lead to permanent damage to the kidney.

After delivery the symptoms and signs rapidly abate, but in some cases high blood pressure or albuminuria may persist and may lead to the onset of postpartum eclampsia unless carefully treated. The longer the pre-eclamptic toxæmia has been allowed to persist the greater are the chances of permanent damage to the kidney and the more slowly will the signs and symptoms abate.

Dietetic precautions, regulation of bowels, favouring the free secretion of urine and mental and physical rest are essential during the puerperium.

ECLAMPSIA

This is a convulsive disease occurring in pregnant, parturient or puerperal women, usually characterised by high blood pressure, marked albuminuria, cedema, and such symptoms as headache, dizziness, disturbances of vision, epigastric pain, convulsions and coma, sometimes ending in death.

Incidence. It is more common among primiparæ than among multiparæ. Over 75 per cent. of the cases occur in primiparæ. The striking fact about the disease is that it occurs more commonly in certain areas than in others, and what is even more significant,

the severity of the disease is much greater in certain centres than in others. It has been suggested that eclampsia occurs more frequently when the humidity is greater and particularly during the winter and rainy seasons; but a careful investigation into its incidence in relation to atmospheric conditions over a number of years has not revealed any definite increase in the particularly humid months of the year or when the rainfall was much greater. It has been noted, however, that after rains following a dry and hot weather the incidence of eclampsia has been greater.

The severity of the disease, however, varies in different localities. Occasionally one may have a long series of cases of a mild type, to be followed by an extremely severe type of the disease in the next few cases; so that statistics relating to the efficacy of any particular method of treatment are completely vitiated, unless a large number of cases are taken into consideration.

Causation. Eclampsia has been known as a disease of theories, and this sums up the present position as to its causation. Many theories have been advanced from time to time, and although some of them have now been given up definitely, it may be said that no definite causative factor has yet been recognised as playing a predominant part in the ætiology of this condition.

The facts to be borne in mind in discussing the causation of this disease are:—

(1) That it occurs only during pregnancy, labour or in the puerperium.

(2) That primigravidae are much more frequently affected than multiparæ.

(3) The incidence of this disease is greater in certain abnormal conditions in pregnancy, such as twins, hydramnios.

(4) That the symptom complex of this condition, namely, hypertension, albuminuria, etc., may result either in the occurrence of eclampsia or in concealed accidental hæmorrhage.

(5) That occasionally, without any obvious prodromal sign or symptom, the disease may manifest itself, sometimes in a severe form.

Among the many theories that have been advanced from time to time as to the causation of eclampsia are:—

(1) *Uræmia*. The occurrence of albumin in the urine and the later manifestation of nephritis gave ground for the belief that eclampsia was akin to uræmia and that the convulsions were probably the result of actual renal insufficiency. We now know that albuminuria is not necessarily a sign antecedent to the occurrence of eclampsia, and that the possibility is that the uræmic symptoms, if present at all, are secondary and not primary.

(2) *Bacterial Theory.* It has been suggested that bacterial infection might be the cause of the toxæmia and that the disease may be due to a filtrable virus whose toxins may be responsible for the signs and symptoms. So far, however, no particular organism has been isolated, and it seems doubtful if this theory can explain all the facts concerning this condition.

(3) *Absorption of Intestinal Toxins.* The disease has been ascribed to certain toxic protein derivatives which may be absorbed into the blood stream but not neutralised by the antibodies; or in some cases the antibodies are not sufficient to neutralise both the products of placental and foetal metabolism and the toxic protein derivatives circulating in the blood stream.

(4) *Endocrine Disturbance.* That the endocrines play a part in the physiology and pathology of pregnancy is becoming more clearly realised of late. One of the earliest to observe this was Linge, who believed the thyroid was a factor in the causation of eclampsia; and basing his views on this theory, Nicholson obtained favourable results with thyroid therapy in some cases of eclampsia. It is not quite certain whether any single endocrine can be held responsible, as in all probability the intimate chain of interaction that exists between the various endocrine glands may be broken somewhere and so cause a disturbance in more than one, which results in the development of eclampsia. Much work yet remains to be done in this field, and while the parathyroids, ovaries, corpus luteum have all been held responsible at some stage or other, recent observations go to show that the posterior pituitary may play a prominent part in the causation of this condition.

Anselmino and Hoffmann found a marked increase of the hormone of the posterior pituitary in the blood. Further investigation is necessary on this subject.

(5) *Effect of Dietary Alterations.* The part played by diet in the causation of eclampsia has been brought to the forefront since the Great War 1914-18. It was observed that in Germany during the last two years of the War, when conditions were most unfavourable for the proper supply of foodstuffs, and the civilian population was grossly underfed, the incidence of eclampsia fell to nearly 25 per cent. of what it was just before the War.

A clinical observation has been made that an excess of certain articles of diet, particularly proteins and fats, predispose to this condition, while deficiency of diet in certain vitamins and minerals, particularly calcium, may lead to the manifestation of toxæmia.

(6) *Absorption of Foetal Elements or Foetal Metabolic Products.* It has been suggested that eclampsia may be a form of anaphylaxis due to the introduction of a foreign protein which may be of foetal

origin. It is possible that certain of the foetal elements or certain metabolic products from the foetus may find their way into the maternal blood stream and give rise to a toxæmia.

It would appear from what has been stated above that no single theory is likely to prove satisfactory and explain all cases of eclampsia. The term toxæmia covers a number of conditions which may be caused by different factors not all attributable to one particular cause.

It has been stated that the disease is relatively less common in warm climates or tropical countries. The actual incidence of the disease as proved by statistical tables quoted by different authors goes to show that the disease is quite as common in the tropical countries as in temperate climates.

Pathology. The organs chiefly affected in this condition are the liver, kidneys and the brain. Secondary changes may be noted in the heart, lungs, spleen, placenta, etc.

Liver. The most typical changes are to be found in this organ. The whole organ is pale yellow in colour with red areas underneath the capsule. There is fatty degeneration of the periphery of the lobules, with capillary thrombosis and hæmorrhage.

Kidneys. The changes noted in the kidneys are suggestive of a glomerulo-nephritis. The glomerular capillaries are widened, degenerative changes occur in the epithelium of the convoluted tubules which may vary from cloudy swelling and fatty degeneration to acute necrosis.

Brain. Oedema of the brain is found in many cases, and in a few hyperæmia without oedema and areas of thrombosis and capillary hæmorrhages may be met with.

The lungs are often normal; sometimes oedema may be present, or occasionally signs of pneumonia or broncho-pneumonia. Degenerative changes occur in the heart muscle, varying from cloudy swelling to fatty change; sometimes thrombosis occurs.

The placenta may show areas of hæmorrhage and thrombosis with retroplacental clots and infarcts.

Clinical Signs and Symptoms. In a large number of cases of eclampsia the signs and symptoms of pre-eclamptic toxæmia are present. In some cases, however, of the fulminant variety no signs or symptoms may be present, and a fit may be the first warning. The chief symptoms of an imminent attack of eclampsia are headache, giddiness, disturbances of vision such as dimness, flashes of light, photophobia or even complete blindness, vomiting, epigastric pain and a sinking feeling. Together with these symptoms a sudden rise of blood pressure, particularly over 160 mm., systolic, diminution in the quantity of urine, with albumin, sometimes actual

suppression, would give a graphic picture of an imminent disaster in the shape of an eclamptic convulsion.

The Eclamptic Convulsion, or the Fit. When the woman actually develops the convulsive attack four stages are recognised:—

- (1) The premonitory stage.
- (2) The tonic stage.
- (3) The clonic stage.
- (4) The stage of coma.

The Premonitory Stage. During this stage the patient becomes unconscious, the pupils dilate, the eyes are turned to one side and fixed or roll from side to side; twitchings of the face and hands may occur. This stage may last from a few seconds to half a minute.

The Tonic Stage. The whole body now becomes rigid, the features are distorted, the arms flexed and hands clenched, the body being in a condition of tonic spasm. This stage lasts for a few seconds and is followed by the clonic stage.

The Clonic Stage. In this stage there is alternate contraction and relaxation of the muscles; the jaw is clenched; the tongue may be bitten; the twitchings begin in the face, around the angle of the mouth, and gradually the arm and the leg on one side of the body; then the whole body is involved in the convulsive attacks. The face is cyanosed, and if the patient is not properly protected she may fall from the bed and injure herself, sometimes seriously. The tongue protrudes and in the clonic convulsions may be bitten badly. There is froth in the mouth; the breathing becomes stertorous. This stage lasts from half to two minutes and the patient then passes into the fourth stage, the stage of coma.

Coma. In this stage the convulsive movements cease; a few jerks or twitchings may take place at intervals. The patient lies quiet, stertorous breathing becomes established, coma supervens and the respirations gradually quieten down. In favourable cases the patient wakes after a short time and is not conscious of anything that has taken place before.

The temperature may rise during a fit; the pulse-rate is increased and the blood pressure may be raised. The fits may occur every few minutes, but usually they come on at longer intervals of from twenty minutes to one hour. Sometimes, even after a single fit, the patient may pass off into deep coma from which she never recovers. In other cases fits may occur in quick succession leading to a condition called status eclampticus where as many as eighty to a hundred fits may occur. On the other hand,

the patient may remain in a state of coma almost throughout. Again, in other cases the patient is conscious between the fits but just before each fit she passes into a restless condition.

If albuminuria was not present before the attack it usually appears after the first fit. Reduction in the amount of urine is constant, and in some cases there may be anuria.

Time of Onset of Fits. Eclampsia is more frequent during the last trimester and may occur either—

- (1) Antenatally (intercurrent eclampsia) where the patient recovers from an attack and goes on to term;
- (2) Antepartum—occurring before the onset of labour, often leading to termination of pregnancy;
- (3) Intrapartum—occurring when the woman is in labour;
- (4) Postpartum—occurring for the first time after delivery or during the puerperium.

Postpartum eclampsia occurs more frequently within the first twenty-four hours after delivery. But cases have been reported, and it is within our experience where the fits have appeared as late as twenty-seven days after delivery. In cases of antepartum eclampsia labour pains may start a few hours after the eclamptic fit; occasionally the woman may completely recover and pass through the later weeks of pregnancy and be confined at the normal period without any further trouble. This is known as antenatal or intercurrent eclampsia.

In the more favourable cases the convulsions gradually become less frequent and severe; coma lightens; temperature subsides; pulse slows; cyanosis disappears and the patient gradually recovers consciousness; the blood pressure falls and the œdema decreases.

Occasionally mental disturbances may occur, especially in intrapartum and postpartum eclampsia. Disturbances of vision may persist and actual amaurosis may set in which lasts for a few days, but permanent blindness is extremely rare.

Diagnosis. Convulsions and coma being the chief symptoms of eclampsia, it is necessary to bear in mind other conditions which may cause these during pregnancy. Among the conditions that may be responsible for the fits are:—

- (1) Epilepsy.
- (2) Hysteria.
- (3) Uræmia.
- (4) Cerebral malaria.
- (5) Diabetes.
- (6) Strychnine poisoning.
- (7) Irritative cerebral lesions as meningitis and tumours.

During pregnancy there is a tendency for exaggeration of the convulsive symptoms in these diseases. The history of the case, a careful examination of the urine, the blood pressure, the character of the fits, the presence or otherwise of œdema, the examination of the retina and the result of a lumbar puncture would, in the majority of cases, serve to differentiate these conditions from true eclampsia.

In *epilepsy* there may be history of previous convulsions associated with typical aura. The contracted pupils, the diminished or absent reflexes, the low blood pressure and the absence of albumin in the urine are points in favour of epilepsy.

Hysteria will offer no serious difficulty in diagnosis. The absence of any injury, the typical grotesque movements, the consciousness, the urinary findings, the normal blood pressure, the absence of cyanosis or stertorous respiration will point to a typical picture which cannot be confused with eclampsia.

Uræmia. It is impossible to separate true eclampsia from uræmia unless there is a definite history of pre-existing nephritis. Signs referable to the liver are more in favour of an eclamptic origin of the fits. Delirium, jaundice and the occasional presence of petechiæ may be suggestive of hepatic damage.

Strychnine Poisoning. Here the typical convulsive seizures, together with the fact that the patient is conscious, the urinary findings, a fairly normal or slightly increased blood pressure, absence of retinal changes and the history would help to distinguish the condition.

In diabetic coma the history, the smell of acetone in the breath, the glycosuria and hyperglycæmia, air hunger, together with the absence of albuminuria, high blood pressure, etc., will serve to differentiate this condition.

Organic diseases of the brain may be diagnosed by the usual methods, and where there is doubt a spinal puncture may be required.

In the tropics a condition that may occasionally closely simulate an eclamptic attack is *cerebral malaria* occurring in pregnant women. The unconsciousness, the fits, the high temperature and occasional rise of blood pressure may simulate very closely an eclamptic fit. Worse still, in some cases a slight toxæmia in association with cerebral malaria may complete the picture suggestive of an eclamptic fit. The only method of differentiating between the two conditions is by examination of a blood film, which will reveal the presence of malarial parasites.

In every case of convulsions in pregnancy it is better to start with the presumption that they are eclamptic fits, till by differential diagnosis other causes have been definitely established.

Complications. These are :—

(1) Injuries varying from bruises to fractures. The tongue is usually bitten and in some cases it may be so badly injured that it gets swollen, may fall back and occlude the glottis during the period of unconsciousness, causing suffocation and even fatal asphyxia.

(2) Cerebral hæmorrhage may occur.

(3) Hyperpyrexia is a grave complication.

(4) Œdema of the lungs or broncho-pneumonia may sometimes occur.

(5) Heart failure is not uncommon.

(6) Mental instability has already been referred to.

(7) Jaundice is an unfavourable symptom when it does occur.

(8) Retinal changes.

(9) Sepsis may develop in a few cases.

Prognosis.—Maternal. The prognosis with any particular line of treatment should always be based on the study of a large number of cases treated. Variations do occur as regards severity of the disease in particular areas and during particular seasons. It is not at all uncommon to find a series of cases responding very favourably to a particular line of treatment, but sooner or later cases occur in which the same method of treatment gives very unsatisfactory results. In fact no conclusions should be drawn unless a series of at least a hundred cases have been treated by a particular method.

Statistics from different centres go to show that there are wide variations in regard to mortality from this complication. While Stroganoff, in a large series of cases, has been able to show that the mortality is under 6 per cent., it has been as high as 35 to 40 per cent. in some clinics. The average mortality may be said to be about 20 per cent. At the Government Hospital for Women and Children, Madras, there were 12 deaths among 148 cases during the two years, i.e. 8.6 per cent.

The prognosis in this condition depends upon the following factors :—

- (1) The number of fits, their frequency and severity.
- (2) The time of onset.
- (3) The degree of coma.
- (4) Temperature.
- (5) Blood pressure.
- (6) Pulse-rate.
- (7) Œdema.
- (8) Albumin.

(9) Other complications.

(10) The treatment adopted.

Fits—their frequency and duration. The greater the number of fits the graver is the prognosis. It has been found that if a patient has over twelve fits the prognosis is generally grave. Prognosis also depends upon the time at which treatment is first started after the convulsions and the number of fits that the woman has had prior to the commencement of treatment. Occasionally even a single fit may prove fatal. The severity of fits, the duration and frequency with which they occur, are factors to be taken into account in arriving at the prognosis. The more rapidly the fits recur, especially if the patient does not recover consciousness in between, and the longer they last the graver is the prognosis.

The Time of Onset. The prognosis is more serious in the antepartum and intrapartum varieties than in the postpartum variety.

Coma. This is the most important factor to be taken into consideration in forming a prognosis. The deeper the coma, the more severe is the disease. If the patient is conscious or only drowsy in between the fits the prognosis is better; if she passes into deep coma after a single or even a few fits the prognosis is grave.

Temperature. Hyperpyrexia is definitely one of the worst prognostic signs in this condition. If the temperature rises above 104° and keeps steadily at that level, or rises higher, the chances of recovery are small. Mild degrees of fever, within 102° , may not necessarily be of bad prognostic significance.

Pulse. In individual cases the pulse is the best index. If the pulse-rate does not exceed 120 there is no immediate danger; but if faster, weak or compressible, particularly with a low blood pressure, the prognosis is bad.

Blood Pressure. It is difficult to ascertain from the blood pressure alone whether the prognosis is likely to be grave or not. Usually, if it is above 150 mm., the prognosis is not favourable. A sudden fall of blood pressure in the absence of hæmorrhage or shock is of grave import since it indicates myocærdial failure. A persistently high blood pressure, especially if it is above 200 mm., is of bad prognostic significance.

Œdema. A limited amount of œdema is not a bad sign, but when it is generalised or severe, or when there is no œdema, the prognosis is not favourable.

Albuminuria. It is doubtful if the degree of albuminuria by itself gives us any definite indication as to prognosis. Usually, if albuminuria is of a high degree and persistent especially with

high B.P. the prognosis is not favourable. Anuria, hæmoglobinuria and severe albuminuria are of bad omen. If a high degree of albuminuria tends rapidly to decline with treatment the prognosis is more favourable.

Other Complications. Complications of the lungs, such as acute pulmonary cedema and particularly deglutition pneumonia, are serious. Sepsis is common, and when it does occur may run a more or less severe course. Cerebral hæmorrhage, when it does occur, is almost always fatal.

The later complications may be aphasia, mental derangements, hemiplegia or loss of vision.

A point of considerable significance is the ultimate prognosis as opposed to the immediate. Many a woman may apparently recover from an attack of eclampsia, but later may suffer from Hypertension, permanent damage, particularly of the kidneys or the liver. It has been noted that a woman who has had an attack of eclampsia may have a vitiated obstetric life subsequently. Abortions are more frequent; premature deliveries, antepartum hæmorrhage or toxæmias in subsequent pregnancies may occur. But the chief strain seems to be on the kidneys, and this is manifested at subsequent pregnancies by the reappearance of albumin and by other signs of toxæmia.

The term *occult nephritis* has very rightly been given to the condition where there is not any definite sign of renal damage in between pregnancies, but once the woman becomes pregnant, even as early as the twentieth week such signs manifest themselves. A better realisation of the severe damage likely to occur to the kidneys by prolonged albuminuria, high blood pressure and other signs of pregnancy toxæmia has changed the whole outlook as regards the treatment of toxæmias. The longer these symptoms are allowed to persist during pregnancy, the greater is the possibility of permanent damage to the kidney; and if the toxæmia continues for more than two weeks it is almost certain that permanent renal damage will result.

We have classified cases of eclampsia under four heads:—

- (1) The hepatic type,
- (2) The renal type,
- (3) The neural type, and
- (4) The mixed type,

depending upon the degree of involvement of the liver, kidney, nervous system, or a combination of any of these.

In the *hepatic type* it would appear that the main damage is to the liver, and such cases are generally associated with a low

degree or absence of albuminuria, a fairly high blood pressure and very little of oedema.

In the *renal type* there is a high degree of albuminuria; oedema may be prominent; general anasarca may sometimes be present and the blood pressure is raised, occasionally being very high. Retinal changes may also be noted.

In the *neural type* few premonitory signs and symptoms may be noted. The convulsions come on suddenly, are severe and frequent. Albuminuria and oedema are absent and a rise in blood pressure is not appreciable.

In the *mixed type* any combination of these signs and symptoms may be present.

It should now be more clearly realised how any one sign, albuminuria or high blood pressure, cannot by itself give us a sufficient indication as to the prognosis in a particular case; hepatic involvement, if serious, would appear to give a worse prognosis than renal involvement, while the neural type is the worst of all.

Foetal Prognosis. The foetal prognosis is definitely bad in cases of eclampsia. Nearly half of the children are still-born or die in the neonatal period. The chief factors that are responsible for this high mortality are prematurity, toxæmia, the effect of treatment of the mother upon the foetus and asphyxia.

Treatment.—Prophylactic. We have already referred to prophylaxis in connection with pre-eclamptic toxæmia. A rational method of prophylaxis is not possible till the exact causation of the condition is known; but experience has shown that it is possible in the very large majority of cases to prevent the onset of eclampsia. Very rarely, however, a case occurs without any premonitory signs or symptoms, and such a case is generally, of a severe type. Efficient antenatal care, frequent examination of the urine (noting the quantity and albumin content,) estimation of the blood pressure and the weight of the patient, would go far to lessen the incidence of this condition. Proper antenatal hygiene and a well-regulated dietary, with elimination of certain food stuffs are of great import. The bowels should be kept free. If in spite of such precautions, toxæmia appears the patient should be put to bed at once preferably in an institution and treatment adopted on the lines suggested for pre-eclamptic toxæmia.

In cases that do not respond promptly to treatment, the question of termination of pregnancy should be considered, especially in view of what has already been stated, that the longer the toxæmia is allowed to persist the greater is the possibility of permanent damage to the kidney.

Curative. When, in spite of prophylactic treatment, eclampsia manifests itself, a definite line of treatment should be followed. Nothing is more distressing than to jump from one method of treatment to another, in the necessarily anxious period when the patient does not show any immediate sign of response.

Two definite lines of treatment are in vogue:—

- (1) The conservative treatment, and
- (2) The radical treatment.

In the *conservative* line of treatment the patient is subjected to medicinal methods and termination of pregnancy is not effected by any radical measures.

On the other hand, the advocates of the *radical* treatment believe that immediate delivery is the most important step in the treatment of eclampsia. They hold that eclampsia is the result of some abnormal processes connected with the foetus *in utero*, and the sooner the uterus is emptied the better it is for the patient. Statistics have been quoted in plenty to support this line of treatment, but on the whole it may be said that at present it has not found any very large support among obstetricians. We shall refer to the details of this method of treatment later.

CONSERVATIVE TREATMENT

This is by far the most commonly adopted method of treatment, and while variations are necessarily found in the details the main principles are the same. We shall describe some of the common methods of treatment.

Stroganoff's Treatment

Stroganoff has given the following scheme of "the improved method in the treatment of eclampsia":—

During the fits the patient should be protected against injuries; the tongue protected from being bitten and oxygen should be given after the fits to counteract asphyxia. Chloroform is harmful in typical fits, but if the patient is restless it is useful.

The general principles of treatment are:—

(1) **Removal of all Sources of external irritations.** The patient should be kept in a darkened room free from noise and any examination reduced to the minimum.

(2) **Administration of Narcotics.** Morphine and chloral hydrate, according to directions below:—

At the commencement of treatment, $\frac{1}{4}$ to $\frac{1}{2}$ grain morphine hypodermically.

One hour later 30 to 40 grains chloral hydrate per rectum or per os.

Two hours later $\frac{1}{4}$ to $\frac{1}{2}$ grain morphia hypodermically.

Four hours later (seven hours from commencement of treatment) repeat the chloral hydrate, 30 to 40 grains.

Six hours later (thirteen hours from the beginning of treatment) 24 to 32 grains of chloral hydrate.

Eight hours later (twenty-one hours after commencement) repeat the above treatment.

When the patient is conscious, chloral hydrate is given by mouth with 2 to 4 oz. of milk, and in the unconscious condition per rectum, with milk and physiological saline $3\frac{1}{2}$ oz. each. The dose is increased in the case of severe eclampsia in strong individuals and diminished for mild forms.

Chloroform, $\frac{1}{2}$ to 2 drachms, is administered in the presence of a fit.

On the second day undelivered patients receive 16 to 24 grains chloral hydrate three times a day in the absence of fits during fourteen hours; When the patient has not any prodromata or fits the dosage may be diminished.

(3) **Venesection.** If fits occur two or three times, or even once in severe form, in spite of administration of morphine and chloral hydrate, it is necessary to perform venesection, drawing off 14 oz. of blood. This is not resorted to if delivery is expected within the next one or two hours.

(4) **Delivery.** As soon as the eclamptic patient can be delivered without harm to herself and child, delivery is undertaken either with forceps, or rarely by extraction after podalic version if necessary. In the absence of any contra-indication the bag of membranes is ruptured, if the os has dilated to two fingers in a multipara and about three fingers in a primigravida.

(5) **Maintenance of Regular Functions of Chief Organs.—**

(a) *Kidneys and Skin.* The patient is kept warm with hot-water bottles placed at the knees and in the region of the abdomen. Hot tea diluted with milk should be given to conscious patients; unconscious patients must be given milk and physiological salt solution about 14 oz. per day, usually with chloral hydrate, per rectum.

(b) *Lungs.* Oxygen is given after a fit, and by removal of all hindrance to the respiratory movements a supply of pure warm air is ensured. Unconscious eclamptic patients should be kept chiefly on the right side. Careful cleansing of the mouth and nose from mucus, blood and vomited matter is necessary.

(c) *Heart.* If the pulse-rate is 110 or higher, give digitalis, and when the heart is still weaker, camphor and caffeine. Continuous observation of the patient and her child is needed for twenty-four hours after delivery.

In very severe cases, 144 grains of chloral hydrate and $\frac{1}{2}$ grain of morphia are introduced in the course of fourteen hours, and chloroform narcosis may be necessary several times until the fits cease.

Other Methods. The Dublin method of treatment was first suggested by Tweedy, master of Rotunda hospital. The chief principles underlying his treatment were, starvation and elimination, together with the use of certain selected narcotics to control the fits. This line of treatment was slightly modified and in later years the principles adopted were, careful nursing and the use of morphine up 2 grain in 24 hours. Atropine is combined with morphine if the respiration became slow. Poultices to the loin, colon and gastric lavage, purgatives, submammary saline and glucose intravenously are given. Chloroform is avoided, open ether being used as an anæsthetic when necessary.

We shall now give in detail the treatment that has been practised by us for some years: The general principles are the administration of sedatives, starvation, elimination and dehydration, reduction of blood pressure, non-interference with labour, except under certain definite conditions—even then to a limited extent, and treatment of complications.

As soon as possible after the patient has been admitted, if she has had fits recently or is likely to develop a fit as judged from her restless attitude, she is given an injection of $\frac{1}{2}$ gram morphia, with 1/100 grain of atropine sulphate, and transferred to a separate room which is used only for purposes of treating eclamptics. It is desirable to isolate the patient in this manner, both for her own sake and to prevent unnecessary alarm in the common delivery room used by other patients as well. The room is so furnished that the patient can be treated for the eclampsia and delivery effected by operative procedures, if necessary. The patient is put on a special eclamptic bed which has got side supports about 9 ins. high, so that during a fit she may not fall down and seriously injure herself. If the patient is restless at the time of admission she should be quietened by a dose of morphia before proceeding with the necessary examination. If this precaution is not taken, even such procedures as abdominal palpation, catheterisation or vaginal examination may occasionally provoke a severe convulsive fit. We are not in favour of the administration of chloroform to control the fits except on rare occasions, such as in the condition of status eclampticus, or to help delivery during the second stage of labour. Perfect quiet should be maintained in this room and all sources of irritation must be avoided. The patient is kept in

charge of a trained nurse accustomed to deal with eclampsia and its complications.

When the patient has been put on the eclamptic bed all tight-fitting clothes are loosened, jewels removed, and the patient carefully examined as regards her temperature, pulse, respiration, blood pressure, urine analysis, the height of the uterus, whether in labour or not, and if in labour the condition of the cervix and the extent of its dilatation, and other incidental factors necessary for a correct estimation of the course of labour.

The treatment for eclampsia can be considered under the following headings:—

- (1) Treatment during a fit.
- (2) Prevention of fits.
- (3) Management of labour.
- (4) Prevention and treatment of complications.
- (5) After-treatment.

Treatment during a Fit. During a fit the woman is likely to injure herself by falling down or biting her tongue. It is therefore necessary that she is kept in a properly prepared bed, with side supports. A mouth gag is inserted to prevent the patient from biting her tongue. Care should be taken to see that the mouth gag is properly inserted between the molar teeth, as otherwise during a fit careless insertion of the gag between the incisors may easily cause their dislocation. The gag should be inserted as soon as the first signs of the fit are apparent; in fact, in some cases it may be desirable to insert the gag when the patient is inclined to get restless. As soon as the fits have ceased the mouth gag should be removed, taking care to see that the tongue is within the mouth and not protruding.

All tight-fitting clothes should be removed, particularly on the chest, as they are likely to embarrass respiration.

Occasionally during a fit the respirations may slow down and even stop temporarily. Artificial respiration must be performed under such circumstances, together with inhalations of oxygen.

The mouth should be cleared of all mucus immediately after a fit and the tongue should be kept as clean as possible; it is preferable to make the patient lie on her sides alternately after the fit is over, with the head at a lower level to allow the mucus and saliva to escape thus preventing hypostatic congestion of the lungs or deglutition pneumonia. The patient is put more often on her right side than her left to relieve any pressure upon the heart.

Prevention of Fits. This is our immediate objective, and so long as we are not definitely in a position to ascertain the particular ætiological factors and thus control the condition, the treatment

must be largely empirical being based upon experience. It is for this very reason that there is such wide variation as to what is necessary and what is not in the methods of treatment advocated. Our own experience is that the fits are most often controlled by the method given below.

Immediately after a fit the patient should be given an injection of morphine tartrate, $\frac{1}{4}$ grain, with atropine $\frac{1}{400}$ grain. This may have to be repeated twice or thrice at intervals of 2-3 hours if fits should recur. The atropine is given to prevent congestion and oedema of the lungs so likely to occur in this condition, particularly when morphia is administered. It is rarely necessary for the total amount to exceed $1\frac{1}{2}$ grains in the twenty-four hours. It is useful to combine this with administration of chloral and bromide per rectum (30 grains of chloral hydras with 30 grains potassium bromide) or by mouth 10 grains of each repeated if necessary once in 3-4 hours. The use of Paraldehyde as a means of producing sedation is being increasingly recognised.

Simultaneously with the administration of morphine it is important to reduce the blood pressure. This may be done by injection of $\frac{1}{4}$ c.c. of veratrone, the active principle of *veratrum viride*. Veratrone produces a fairly sharp drop in the blood pressure, and should therefore be administered only in those cases where the systolic blood pressure is above 140 mm. We have very rarely felt the need for giving more than $\frac{1}{4}$ c.c. veratrone, and it has been our experience that larger doses sometimes produce a very sharp fall in the blood pressure, accompanied with severe vomiting and symptoms of collapse. Even with the small dose used, the blood pressure may drop too low, sometimes below 60 mm., and in such cases glucose 25-50 c.c. of 10% solution should be given intravenously to counteract the temporary condition of extreme hypotension.

Particular stress should be laid upon the fact that starvation and elimination with dehydration form an essential part in the treatment of eclampsia. So long as the patient is unconscious she should not be given nourishment by mouth, and it is our practice not to allow anything by mouth for at least twelve hours after she has regained consciousness. The administration of any food, even fluids, not only serves as a source of irritation, but is likely to lead to troublesome lung complications, some of the fluid gravitating into the upper air passages.

If the patient is conscious at the time of admission she should immediately be given a large saline purgative, $1\frac{1}{2}$ oz. of mag. sulph. in concentrated solution. If she is unconscious a large soap sud-enema should be given, and as soon as she regains consciousness

the saline purgative ought to be administered. Occasionally 4 ozs. of the solution of mag. sulph. may be left in the bowels after the enema.

A method of treatment that has been discarded by us for some years is gastric lavage. Our experience is that it is not only unnecessary but positively harmful. Washing out the stomach is attended with such an amount of irritation to the patient that fits are provoked. Our experience goes to prove that one of the serious risks of eclampsia, namely, lung complications, has been largely eliminated since gastric lavage was given up.

If high blood pressure should persist, and especially if there are signs of failure of the right side of the heart, venesection is performed and 20 to 30 oz. of blood withdrawn. In cases where the patient is in the second stage of labour and delivery can be effected we do not advocate venesection, as the termination of labour is accompanied by sufficient loss of blood to lower the blood pressure.

Management of Labour. The question of management of labour arises in cases of antepartum and intrapartum eclampsia. In antenatal eclampsia, if the signs and symptoms abate with the treatment outlined, the patient gradually recovers consciousness and there is no need to interfere with the course of pregnancy. The patient under such circumstances will gradually show a decided improvement which is noted by the fact that the blood pressure steadily falls, that the albumin in the urine decreases and ultimately disappears and the oedema subsides. If such progress is maintained the pregnancy is allowed to continue. The patient should be under observation and the restrictions with regard to diet, etc., should be followed. In particular, the patient should be told about the warning symptoms of threatening eclampsia and advised to seek medical assistance forthwith if any of these symptoms manifest themselves. It is preferable, however, that such a patient should be hospitalised till the delivery is over.

In spite of treatment some of the more important signs and symptoms of toxæmia may not abate, although the patient may recover from the eclamptic attack. Thus the blood pressure may persistently remain high or albuminuria continue. Under such circumstances, if after 5 to 10 days of treatment there is no definite improvement, the question of termination of pregnancy should be considered. The necessity to terminate pregnancy at this stage arises out of two considerations:—

- (1) The persistence of the severe signs of toxæmia is always suggestive of a possible recurrence of the eclamptic con-

dition at any time. In such cases it is not always possible to control the attack and a fatal result may sometimes ensue.

- (2) Another equally important consideration is the permanent damage to the kidneys or the development of chronic hypertension if such signs and symptoms of toxæmia are permitted to persist.

These signs of permanent renal damage may show themselves in one of two ways:—

- (a) As signs and symptoms of chronic nephritis, or
- (b) As signs and symptoms suggestive of occult nephritis.

In the former case the resultant degenerative condition in the renal tissues will become manifest during the puerperium or a little later, and will continue just as an ordinary case of chronic nephritis may, after an attack of acute nephritis. The patient has in fact passed on to the condition of chronic nephritis.

In the latter case, that is, in occult nephritis, the condition is not apparent except when the woman becomes pregnant again. Although the damage to the kidney is permanent, it is not sufficiently pronounced to show the ordinary manifestations of renal damage between pregnancies. When, however, the woman becomes pregnant again, the stress involved would seem to produce a degree of renal insufficiency and the signs indicating the presence of a nephritis manifest themselves in the second trimester.

It may in this connection be stated that a rapid onset of toxæmia with a sudden recovery is less likely to lead to permanent damage of the kidney than a more slow and insidious attack, lasting for a longer period and probably running a more chronic course. Thus a moderate type of eclampsia which responds to treatment readily is less likely to produce bad after effects than a moderate type of pre-eclamptic toxæmia which has persisted for some time.

In cases of antenatal and antepartum eclampsia where the fits persist in spite of treatment, the termination of pregnancy by conservative methods has proved beneficial and should be adopted irrespective of the period of pregnancy.

The mode of termination of pregnancy is a matter of importance. Medicinal methods of induction of labour may not be useful in such cases. Other methods of induction must be thought of. The three methods available are:—

- (1) Rupture of membranes.
- (2) Krause's method by insertion of bougies, and
- (3) Cæsarean section.

(1) We have for some years adopted the practice of rupturing the membranes artificially low down in all cases where the fits are not easily brought under control. Our experience goes to show that this is a valuable method of controlling the fits in the majority of cases and labour follows within a few hours and terminates quickly, improving the prognosis for the mother.

(2) We do not recommend Krause's method of insertion of the bougies as it is not a sure method and often increases the risks of sepsis.

(3) The third method is Cæsarean section. We do not advocate this method, and we feel that it is not desirable to perform a Cæsarean section in a woman who is suffering from toxæmia, unless there are other indications such as a contracted pelvis, concealed accidental hæmorrhage, placenta prævia etc. We consider that the strain of a major operation adversely affects the patient who is already suffering from the toxæmia, strain on the heart, damaged kidney and a nervous system which is in a condition of extreme irritability.

Management of Labour in Intrapartum Eclampsia. Here the position is different. The woman is already in labour, and the question arises what assistance should be given by the obstetrician. We hold the view that no interference is indicated in the early stages of labour, but that labour should be helped in the second stage in the interests of the mother and the foetus. The reason why we prefer to terminate the second stage by artificial methods is two-fold:—

(1) In the interests of the mother. It is well known that in eclampsia there is a great deal of strain on the heart and it has to work against the increased high blood pressure. If to this is added the strain of a prolonged second stage, when the accessory muscles of labour are brought into play, it is obvious that occasionally the heart may be more severely strained than is desirable. For this reason, when the dilatation is complete and the head is in the midcavity, instead of waiting for the termination of labour by natural powers, we prefer to apply forceps and deliver. In breech presentations, extraction may be done under such circumstances.

(2) In the interests of the foetus. This may not be quite so well appreciated, but our experience is that the foetus in an eclamptic is more likely to suffer from the toxæmic condition of the mother after the membranes have ruptured than before, and that the longer it is left inside the uterus after rupture of the membranes the greater is the danger involved and the possibility of asphyxia. For this reason we prefer, in the interests of the foetus to terminate the second stage as early as possible.

An additional factor is that the method of treatment adopted has also a bearing upon this. Morphia is our sheet anchor in the treatment of eclampsia to produce a sedative effect; and morphia, given fairly late in labour is, it is well known, deleterious to the interests of the foetus; we prefer to deliver it at an early stage consistent with safety. We strongly hold that forcible methods of delivery have no place in the management of labour in an eclamptic. For women with toxæmia, local infiltration anaesthesia is the choice not only for cæsarean section when indicated, but also for episiotomy and low forceps. Spinal anaesthesia is the most dangerous type for obstetric patients.

Prevention and Treatment of Complications. The complications that are likely to occur in the course of eclampsia have already been mentioned. The majority of them can be avoided with careful nursing and prompt attention to details.

Injury to the Tongue and Lips. It has already been stated that care should be taken to see that the tongue is not bitten during a fit. A mouth gag preferably one of rubber should be handy and should be inserted between the molars, and so long as the fit continues the gag should be kept in position. Should the tongue be bitten, a careful watch must be kept during the unconscious condition to see that the swollen tongue does not occlude the glottis and thus interfere with respiration. It is also important to ensure that a tongue which is bitten or lacerated is properly cleaned and, if necessary, sutured. Consequent upon the retention of mucus and the dribbling of saliva, a fetid odour in the mouth is not uncommon in unconscious eclamptics. Careful nursing is required to see that saliva and mucus are not allowed to accumulate, that the mouth is frequently cleaned with gauze soaked in an antiseptic such as Condy's fluid and the tongue, lips and gums are smeared with glycerinum boracis.

Pulmonary Complications. These are very frequent in eclampsia and can to a large extent be avoided by careful nursing. The unconscious or subconscious patient should not be allowed to constantly lie on her back, as the mucus and the saliva which are secreted freely tend to gravitate into the upper air passages and lead to infection of the lungs. The nurse should turn the patient from one side to another, preferably to the right side more often, to avoid any stress upon the heart. Occasionally a mild attack of broncho-pneumonia is inevitable. In some cases, owing to the high blood pressure and the consequent failure of the left side of the heart, cedema of the lungs appears.

Hyperpyrexia. This is a most troublesome complication when it does occur. Its exact causation is not known; it does not depend upon the number of fits or upon the severity of the attack. We have seen the condition in patients who have had only a few attacks, as well as in cases where a large number of fits have occurred. If the temperature persists above 104° the prognosis is grave. A constant watch should therefore be kept over the temperature, and every effort should be made to bring it down by the application of an ice-cap, cold sponging of the extremities, iced enemata, if necessary, or by other antipyretic measures.

In the tropics, particularly during the hot weather, hyperpyrexia may cause incalculable harm. Under such circumstances an air conditioned room is invaluable to keep the temperature of the room as cool as possible, so that the condition is not influenced adversely by the extreme heat of the surrounding atmosphere.

Mental Disturbances. These are by no means infrequent in eclampsia, and follow antepartum, intrapartum and postpartum varieties. Usually the type of disturbance is mania. The patients are extremely violent, restless, incoherent in their talk and require considerable skill to manage. Fortunately, in the large majority of cases the attack lasts for a short period, twenty-four to forty-eight hours, and gradually tends to subside. In other cases it may be more persistent and may last for a week or a fortnight. The mental symptoms are aggravated if puerperal sepsis is present.

The treatment of this condition consists in the administration of sedatives; bromides in large doses per rectum. Luminol may be given in some cases. It may be necessary to give morphia to quieten the patient. In others again a straight jacket or delirium sheet may be necessary to prevent the patient from injuring herself. Care should be taken to see that the patient is properly fed at regular intervals. Nasal feeding may have to be resorted to sometimes. The bowels must be kept free and the genital passage properly protected to prevent the possibility of septic infection.

Cardiac Failure. One of the conditions which may cause anxiety is failure of the myocardium. It is obvious that owing to the toxæmia, the increased high blood pressure and the condition of the lungs, the heart is working at a great disadvantage and in some cases cardiac failure occurs. Careful watch, therefore, must be kept over the condition of the heart and suitable stimulants administered. Among the stimulants that have been found useful are camphor-in-oil, coramine, cardatone, musk and ether, digalen, etc. Glucose and saline or calcium gluconate intravenously may be given with advantage.

Septic Complications. These are troublesome to deal with when they do occur. Care in the conduct of labour, scrupulous cleanliness, the minimum amount of artificial interference and meticulous care in the puerperium are most likely to eliminate the possibilities of such a complication. When puerperal sepsis does occur it must be treated along the lines suggested in the chapter on sepsis.

Occasionally, due to catheterisation, a *bacillus coli* infection of the bladder may occur. Under such circumstances sulphonamide therapy, urinary antiseptics, large doses of barley-water, etc., are needed to combat this.

Visual Disturbances. In the majority of cases of toxæmia, mild disturbances of vision occur. Amblyopia, photophobia, retinitis, partial blindness, detachment of retina, etc., are rare complications. Extremely rarely, total blindness may occur. We have observed a case where such total blindness manifested itself on the seventh day after the eclamptic attack, but fortunately vision was restored after a week. Cases are, however, recorded where the blindness has been permanent.

Other complications, such as jaundice, cerebral hæmorrhage, etc., should be treated symptomatically.

The After-Care of the Eclamptic. The after-treatment of an eclamptic is just as important as the treatment during the actual condition. It has already been stated that nothing should be given by mouth until the patient is fully conscious, and we prefer not to give any drinks for at least twelve hours after the patient has regained consciousness. If however, the patient is very insistent and complains of extreme thirst, small quantities of barley-water, glucose or orange juice may be given during this period. When the patient is completely conscious the diet depends upon the condition of the blood pressure and quantity of albumin in the urine. It is better for the first twenty-four hours not to give the patient anything except water, aerated drinks and fruit juice. After this period, and provided the blood pressure has fallen and the albumin has considerably diminished, the patient may, for the next three or four days, be kept on a diet of milk, barley-water, glucose and fruit juice. We do not give more than a pint of milk in twenty-four hours, care being taken throughout this period to watch the trend of the blood pressure and the amount of albumin in the urine and the quantity of urine passed. On the first sign of increasing blood pressure or albuminuria, all diet should be interdicted and only the blandest fluids, such as water and glucose water, should be

administered. If, however, the condition of the patient is progressively improving after the fifth day the quantity of milk may gradually be increased, and if the albumin totally disappears it is permissible to give the patient some solid diet, such as bread or soft boiled rice with milk. We prefer this strict dietetic regimen for ten to fourteen days after the complete cessation of the fits. It is desirable to have the diet salt free or restricted in salt. We have seen that temporary indiscretions have resulted in a recurrence of the fits as late as the fourteenth day after the first attack. Besides the dietetic regulations, care must be taken to see that elimination is maintained. For this purpose a saline purgative is generally given every day in the form of 2 to 4 drachms of mag. sulph. in single or repeated doses. Barley water or very mild diuretics may be useful in increasing the quantity of urine secreted. If suppression of urine, however, occurs this should be treated by Intravenous Hypertonic glucose in saline 25 c.c. of 25% solution, hot poultices around the kidney region in the loins, and sometimes cupping may be useful.

The importance of good after-care during the puerperium has already been emphasised with a view to eliminating septic complications.

RADICAL TREATMENT

So far we have expressed our views on what may be called the conservative line of treatment of eclampsia; but there is another school of thought which believes that rapid delivery is the proper method of treatment in eclampsia. It holds that eclampsia is the result of some abnormal process in the ovum, and not till the foetus and placenta are removed will the source of the toxæmia be eliminated. Thus the rationale of emptying the uterus is based upon the theory that the active factor concerned in the causation of the condition is the presence of the products of conception.

The method of effecting delivery depends upon several factors, such as the period of pregnancy, the surroundings of the patient, the presence of any complications, the condition of the cervix, and whether or not the patient is in labour. *Accouchement force* or rapid methods of dilatation of the cervix, followed by immediate delivery, have now been completely given up by most obstetricians, and even the advocates of a rapid method of delivery are agreed that such methods are not to be thought of, as they lead to a heavy incidence of maternal mortality. Rapid methods of delivery may be either through the vaginal route or through the abdominal route. If the cervix is not dilated and the patient is not in labour,

the abdominal route is to be preferred. If, however, the woman is in labour, then it depends, upon the condition of the pelvis. Occasionally multiple incisions of the cervix, dilatation with static dilators, if necessary, and emptying the uterus by version or by version and breech extraction may be the methods chosen. Others again have advocated vaginal Cæsarean section, if the pelvis is not contracted and the child can be easily delivered.

We do not propose to go into details regarding these methods of treatment, as we hold strongly that radical methods of treatment such as these have no place in the treatment of eclampsia.

OTHER METHODS OF TREATMENT

Besides those already mentioned, there are certain other methods of treatment adopted for this condition. Among these may be mentioned:—

(1) **The Administration of Magnesium Sulphate.** Intravenous injections of magnesium sulphate have been practised for some time now. The rationale of the treatment is that it abstracts water from the tissues into the blood stream and reduces the oedema, lessens cerebral irritation and relieves the comatose condition, lowers the blood pressure and simultaneously favours diuresis. An intravenous injection of 10 c.c. of a 10 per cent. solution of magnesium sulphate is advocated in the early stages of pregnancy and may be repeated daily if the blood pressure does not fall. In cases of eclampsia 20 c.c. of a 10 per cent. solution should be given intravenously every hour till fits cease. If the recurrence of symptoms call for repetition of medication. This should be in addition to other measures such as bromides and cathartics, etc., occasionally intravenous injections of magnesium sulphate lead to certain deleterious symptoms such as restlessness, embarrassment, cyanosis or feeble pulse. In such cases, 10 c.c. of calcium chloride given intravenously will entirely balance many bad effects.

(2) **Intravenous Injection of Glucose.** It has been suggested that one of the methods of lowering blood pressure and favouring diuresis is by the intravenous injection of glucose. 500 c.c. of a 20 per cent. glucose solution is injected intravenously, and another 500 c.c. may be given every two hours, subcutaneous maximum of 2500 c.c. during the twenty-four hours.

(3) **Lumbar Puncture.** This has been advocated as a method of lessening the possibilities of fits. It is well known that the intracranial pressure is increased in some cases and lumbar puncture may, by relieving the tension, lessen the number of fits.

We have not found it useful by itself, but in combination with other methods of treatment it may find a place in selected cases,

(4) **Venesection.** We have already referred to the place of venesection in the treatment of eclampsia. When the blood pressure remains persistently high in spite of the administration of veratrine or other methods outlined, the question of venesection—drawing 20 to 30 oz. of blood—may be considered.

(5) **Thyroid Therapy.** Basing his conclusions on the endocrine ætiology of the condition, Nicholson advocated the use of thyroid extract in the treatment of eclampsia. It would appear that eclampsia is due to a relative deficiency of thyroid and an increase of the posterior pituitary hormone, and for this reason thyroid extract in doses of 20 grains of the desiccated glandular substance has been administered orally. *Liquor thyroïdi* may be used hypodermically in doses of 10 minims till the pulse quickens.

THE QUESTION OF FUTURE PREGNANCY

The obstetrician is occasionally consulted after the recovery of the patient as to the risks in a future pregnancy. It is very difficult under certain circumstances to give definite advice on this point; but every effort should be made carefully to ascertain the condition of the kidneys by examining the urine and by renal efficiency tests. If there is no evidence of kidney damage the patient should be advised to allow a period of four to five years to elapse before risking the chances of another pregnancy. This is due to the possibility of occult nephritis persisting, which condition cannot be diagnosed. Even after that time has elapsed the patient should be advised to seek medical aid from the commencement of pregnancy and to submit herself to treatment if necessary. If, however, a woman has shown evidence of toxæmia at two or more pregnancies, it should definitely be stated that she is unfit for conception; and in such cases we prefer that the patient should be sterilised.

Concealed Accident Hæmorrhage

In some cases of pregnancy toxæmia associated with albuminuria and high blood pressure, antepartum hæmorrhage occurs, the hæmorrhage being not infrequently concealed. In such cases hæmorrhages into the uterine musculature may be present. It has been observed that in severe cases of toxæmia, the patient may develop the convulsions of eclampsia or concealed accidental hæmorrhage. In such cases, owing to the damaged uterine musculature, there is greater tendency for the blood to be concealed,

the foetus generally dies *in utero*, and labour may be complicated by postpartum hæmorrhage. Once the intra-uterine hæmorrhage occurs the blood pressure falls, the albumin tends gradually to disappear and the patient seldom develops fits.

The symptoms, pathology, prognosis and treatment of this condition are dealt with in detail in the chapter on antepartum hæmorrhage.

CHAPTER XVII

DISEASES COMPLICATING PREGNANCY

DURING the course of pregnancy a woman may suffer from any of the diseases to which she is liable in the non-gravid condition. In most cases pregnancy aggravates the disease, and the disease may have an adverse effect on pregnancy. The latter is more likely in certain types of diseases than in others. There are several factors which have a bearing upon the degree to which pregnancy may be influenced unfavourably by the particular disease. It may be stated generally that all diseases which cause an elevation of temperature are likely to have a deleterious effect upon the course of pregnancy and in particular upon the life of the foetus. Thus, in acute infectious diseases, the tendency is for interruption of pregnancy and intra-uterine death of the foetus. This is more marked in those diseases where the range of temperature is high and particularly where it is associated with sudden variations; for example, in cases of relapsing fever, malaria, etc., the chances of abortion or premature labour with intra-uterine death of the foetus are great. The effect of the temperature on the foetus is very marked, as the temperature of the foetus is habitually higher than that of the mother and maintains a relatively greater height when the mother's temperature becomes abnormal. The foetus dies from the effects of increased temperature before such increase becomes fatal to the mother. The temperature of the mother, if raised for a short period above 106° , is fatal to the foetus. Again, the general effect of fevers on the foetus is felt more adversely in the first or third trimester of pregnancy, at either of which period abortion or premature labour is likely to occur.

In diseases associated with cyanosis or respiratory embarrassment death of the foetus *in utero* and interruption of pregnancy are more frequent. Thus, in cases of pneumonia, abortion or premature delivery is very liable to occur. The increased vascosity of the blood would appear to stimulate the uterus to contraction and cause expulsion of the foetus.

In a third variety of diseases, the acute exanthemata, the infection would appear to affect the foetus, and intra-uterine death of the foetus is by no means uncommon.

In acute diseases associated with extreme collapse of the pregnant woman, such as cholera, acute dysentery, death of the foetus generally takes place and labour may be precipitate.

On the other hand, there are certain diseases such as tuberculosis, heart disease and certain anæmias where, in spite of the adverse effect upon the mother, the foetus may not be affected and is born fully developed and apparently healthy. In such cases it would appear as if the foetus had a parasitic existence upon the mother and retained its vitality at the expense of the host.

It is impossible to deal in a work of this kind with all diseases that may occur during the course of pregnancy, as it more properly belongs to the domain of Medicine; but we shall refer to a few of the more common and important diseases that not infrequently affect the pregnant woman:—

(1) Diseases of the cardiovascular system.

(2) Diseases of the respiratory system—

Tuberculosis of the lungs.

Lobar pneumonia.

(3) Acute infectious diseases—

Influenza

Typhoid fever.

Variola, etc.

Relapsing fever.

(4) Specific diseases—

Syphilis.

Gonorrhœa.

Infective granuloma.

(5) Tropical diseases—

Malaria.

Kala-azar.

Blackwater fever.

Cholera.

Filariasis.

Beri-beri.

Leprosy.

(6) Helminthiasis—

Ankylostomiasis.

(7) Diseases of the blood—

Anæmias.

Pernicious anæmia.

Secondary anæmias.

- (8) Diseases of the urinary system—
Pyelitis.
Nephritis.
- (9) Diseases of metabolism—
Diabetes.
- (10) Diseases of the endocrine system—
Exophthalmic goitre.
Myxœdema.
- (11) Diseases of the gastro-intestinal system—
Dysenteries and Diarrhoea.
- (12) Diseases of the nervous system—
Chorea.
Epilepsy.
Peripheral neuritis.
- (13) Deficiency diseases—
Osteomalacia.
Sprue.
- (14) Diseases of the skin—
Albinism.
- (15) Surgical affections during pregnancy—
Appendicitis.
Intestinal obstruction.

DISEASES OF THE CARDIOVASCULAR SYSTEM

During pregnancy the cardiovascular system, particularly the Heart undergoes certain changes to adopt itself to the increased work. This extra strain is due to the increase in the volume of blood in circulation and to the increase in the vascular area through which the circulation has to be maintained due to the increase in the calibre of the uterine vessels and the development of the utero-placental area. The heart is slightly displaced upwards and outwards by the rising up of the diaphragm in the later weeks. It has also been noted that it undergoes a degree of excentric hypertrophy with dilatation of the right side. This is much more marked when there is any abnormality such as Twin Pregnancy, Hydramnios or tumours and when the patient gets into labour owing to the increase of the Blood pressure much above normal. In a healthy gravid woman the heart is able to cope with the increased strain and no serious disturbance occurs. On the other hand, when the heart is diseased, response to the increasing strain of pregnancy may vary with the condition of the myocardium. The

strain upon the heart is more particularly felt in certain stages of pregnancy and labour :—

- (1) In the early weeks when nausea and vomiting are prominent and when the nutrition of the patient is seriously interfered with.
- (2) In the later months, when owing to the increased size of the uterus and the pressure exerted upon the diaphragm and the lungs, impeding free respiratory movements, myocardial insufficiency may occur.
- (3) In the second stage of labour when more than at any other time the strain on the weakened musculature of the heart is most felt.

The common affections of the heart noted during pregnancy are those of the myocardium and of the valves. Very often the two conditions are found in association, one being the result of the other. The common forms of valvular diseases of the heart that may be met with are mitral stenosis, with or without regurgitation; aortic regurgitation and aortic stenosis with regurgitation. Of these, mitral stenosis and aortic regurgitation are the most serious among valvular diseases.

In mitral stenosis the strain upon the left auricle, the pulmonary circulation and the right ventricle is very great; and in view of the fact that in the later weeks of pregnancy respiration is embarrassed by the growing uterus, respiratory complications and involvement of the myocardium are not uncommon. In all cases of chronic valvular diseases of the heart or of the myocardium the most important thing to note is the response of the patient to ordinary physical activity. Can she carry on without discomfort or stand any additional effort? The reserve capacity of the heart is of utmost importance. This is estimated by the response of the heart to effort. Where there is a history of cardiac failure having occurred either before or early in pregnancy the condition should be looked upon with grave suspicion. When actual decompensation exists the woman runs a grave risk. There is dyspnoea, cyanosis, a tendency for cardiac asthma, sleeplessness and restlessness and occasionally Cheyne-Stokes' respirations. Œdema is an important manifestation of cardiac failure and is more liable to develop in mitral than in aortic lesions. It usually commences in the most dependent parts, and generally is first noticed around the ankles in the evenings. Even in severe cases œdema may be confined to the lower extremities. As œdema occurs from a variety of causes in pregnant women it may not be seriously taken note of in the earlier stages. Later the œdema may involve the serous membranes, resulting in ascites, hydrothorax and occasionally

hydropericardium; bronchitis, bronchopneumonia and hæmoptysis are not uncommon. The hæmoptysis is generally the result of chronic venous congestion. The liver may be enlarged and tender. These late manifestations of decompensation of the heart are of grave prognostic significance, and their development should if possible be prevented by suitable treatment in the earlier stages.

Effect of Pregnancy on Heart Disease. It has already been stated that in view of the demands of the growing uterus and its contents there is an increased strain upon a diseased heart, which is liable to result in increased damage. Not infrequently such strain may lead to failure of compensation. This is more likely to occur in multigravidæ than in primigravidæ. The degree of decompensation depends on the condition of the myocardium. Sudden death with cardiac failure is not unlikely and in many of these cases premature labour occurs before the patient collapses.

Effect of Heart Disease on Pregnancy. It may tend to cause abortion or premature labour; increased chances of postpartum hæmorrhage and sudden death after delivery may also result.

Prognosis. The prognosis depends upon the age of the patient, her health during the course of pregnancy, the nature of the cardiac affection, the condition of the myocardium, the presence or otherwise of decompensation and of any other complications. The younger primipara has perhaps a better chance than the old multigravida, as her myocardium has not been subjected to the strain of previous pregnancies.

With regard to the variety of cardiac affection the prognosis in aortic disease is less favourable than in mitral disease, and lesions affecting both valves are graver than when only one is involved. Aortic incompetence, mitral stenosis, aortic stenosis and mitral regurgitation is the order in which the prognosis becomes progressively improved. But there are several other factors to be taken into consideration besides the particular valve affected. The integrity of the myocardium is of the utmost importance in all cases. Where it is not seriously involved, as evident from the response of the heart to effort, and there is absence of any signs or symptoms suggestive of cardiac failure, the prognosis is more favourable.

In all cases where cardiac failure is present the degree of decompensation and the circumstances under which it occurred are important to note. The other factors in arriving at a prognosis are the patient's general health and other complications present, such as hypertension, renal disease, chronic bronchitis and emphysema. Another factor of importance in the prognosis is the response to treatment. In some cases the response is very prompt,

and it is only after such a response has been noted that any accurate prognosis can be arrived at.

Clinical Classification of Cases. Clinically, patients suffering from cardiac lesions may be included in one of three classes:—

(1) Patients with organic disease of the heart who are able to carry on ordinary physical activity without discomfort. In such patients there is no evidence of any congestive heart failure such as dyspnoea, oedema, tachycardia, engorgement of the veins of the neck, enlarged and tender liver, persistent moist râles at the bases of the lungs, or other signs suggestive of decompensation.

(2) Patients with organic heart disease unable to carry on ordinary physical activity without discomfort. These patients may not present any signs of decompensation at rest, but they cannot afford to take the slightest exertion without the signs and symptoms of decompensation manifesting themselves. In other words, these are the border-line cases of decompensation.

(3) Patients with organic heart disease who present signs and symptoms of cardiac decompensation even when at rest. In such cases there is no cardiac reserve and they are in imminent danger of collapse on the slightest strain, more so during labour.

MANAGEMENT OF CARDIAC CASES

When heart disease complicates pregnancy it is important to make a thorough investigation and ascertain the following particulars:—

(1) The causative factors involved in the cardiac disease—that is, whether the disease is congenital or acquired. If acquired, the part played by rheumatic infection in the production of the condition and the period of life when it first occurred. It is also necessary to find out whether there have been any exacerbations of the condition in recent years, and whether recurrent attacks of rheumatic fever have led to further damage to an already diseased heart.

(2) The previous history of the patient should be ascertained; when the first symptoms of heart disease manifested themselves, when a recurrence was noted, whether there was any decompensation, and if so, how often and at what periods? The factors concerned in the causation of the decompensation and how far and how readily it responded to treatment. The period that has elapsed between the last attack of decompensation, if any, and the present period of pregnancy should also be noted.

In cases where previous deliveries have taken place after the development of the heart lesion, a careful history must be elicited as to the response of the heart during the period of pregnancy, at

the time of labour and during the puerperium. The presence or absence of any decompensation at any one of these periods should particularly be noted as well as the nature of the delivery.

(3) The exact nature of the lesion must be ascertained, whether it is a valvular condition or whether the myocardium or the pericardium are involved. In particular, the condition of the myocardium should be noted.

(4) In every case the response of the myocardium to strain must be carefully noted; the extent to which the patient has a reserve power to cope with any increased strain is a good index as to how the heart will stand the strain of pregnancy and labour.

(5) The presence of any complications at the time of delivery should be noted.

A careful examination is necessary to ascertain:—

- (a) The condition of the lungs.
- (b) The condition of the arteries.
- (c) The condition of the liver.
- (d) The presence or absence of oedema, particularly in the lower extremities.
- (e) The condition of the kidneys, the presence or absence of albuminuria with casts.
- (f) The blood pressure, systolic and diastolic.
- (g) The character of the pulse, the degree of force, the presence, any gastro-intestinal disturbances, other signs or symptoms as may be suggestive of derangement of any particular organ.

(6) The number of the pregnancy and the results of the pregnancy should be noted, together with the presence of any anomalies, such as hydramnios, twins, contraction of the uterus.

Having ascertained all these factors we may now proceed to a more thorough consideration of all the issues involved in heart disease complicating pregnancy. The stage at which a woman may come under observation may be:—

- (1) Early in pregnancy, that is, within the first twelve weeks.
- (2) In the second trimester of pregnancy—between the twenty-second and thirty-second week.
- (3) In the last weeks of pregnancy or actually during labour, or immediately after confinement in the puerperium.

We shall take each of these conditions separately and discuss them.

A. CARDIAC DISEASE COMPLICATING PREGNANCY IN THE FIRST TRIMESTER

When a patient is seen at this period a very careful investigation should be made of all the factors that have a bearing upon the cardiac disease. We have already referred to these factors. In particular, the age of the patient, the parity, the nature of the lesion, the condition of the myocardium, the presence of any dilatation, the blood pressure, systolic and diastolic, presence of complications in the lungs, any signs of decompensation, the condition of the kidneys, of the liver and of the stomach should all be noted. A hæmatological examination is also useful.

At this period of pregnancy the patient may present herself in one of three stages :—

(1) **Patients in the Early Weeks of Pregnancy, with Organic Heart Disease, able to carry on Ordinary Physical Activity without Discomfort.** In such cases the patient should be taken into confidence and the position clearly explained as to what risks she is liable to run if certain precautions are not taken. She should be given detailed instructions as regards the hygiene of pregnancy, especially in regard to :—

- (a) Diet.
- (b) Exercise.
- (c) Regulation of bowels.
- (d) Regular periodic visits to the obstetrician or the antenatal clinic.
- (e) Any warning signs or symptoms of decompensation.

The diet should be well balanced with adequate vitamin supply and mineral content and should not contain any indigestible elements. Milk, vegetables, fruits, delicate meats such as fish and chicken are desirable. In particular, beef, pork, and all fatty and rich meat should be avoided. Succulent vegetables are better; vegetables which are bulky and difficult of digestion, such as potatoes, roots, etc., should be avoided.

Regarding exercise much will depend upon her response; but it is well to restrict it to mild forms of exercise and never to perform them till actual fatigue is reached. So far as occupations are concerned it is advisable to restrict them within definite limits so that fatigue or breathlessness may not result. If absolutely essential for livelihood only light occupations for short periods should be accepted.

The bowels should be regulated. It is not advisable to allow constipation to occur. The diet will probably help in regulating the bowels, but if necessary mild laxatives may be given.

The patient must report herself to an antenatal clinic or to the obstetrician concerned at least once a month, so that the extent to which the heart continues to respond to the growing demands of pregnancy may be watched. She should be particularly advised to seek immediate medical aid if there is any breathlessness, cough, fatigue on exertion, palpitation, œdema of the extremities, giddiness, or any other symptoms suggestive of developing decompensation.

If any of these symptoms of decompensation become manifest, the patient comes under the next category of cases, namely :—

(2) **Patient with Organic Heart Disease, unable to carry on Ordinary Physical Activity without Discomfort.** The degree of discomfort may vary, so that the activity may be slightly limited or it may be greatly reduced. The latter may be associated with engorgement of the veins of the neck, crepitations at the bases of the lungs, enlargement of the liver with tenderness and tachycardia.

In this second group the patient should have perfect rest. She must lie in bed for the greater part of the day; no exercise of any sort is permissible. The bowels must be well regulated and the diet should be light and nutritious. The general condition of the patient should be improved, hæmatinics administered if necessary, and the patient's condition carefully watched and cardiac tonics given.

(3) **Patients showing Definite Evidence of Decompensation.** Such patients should preferably be treated in institutions. Careful nursing and absolute rest in bed are essential. They ought to be kept under continuous observation throughout the course of pregnancy until delivery has been effected. Prolonged rest in bed, with cardiac tonics and other measures to be outlined later, depending upon the extent of decompensation and the nature of the lesion, should be adopted.

Among the several methods of treatment to be adopted in conditions where the heart threatens to decompensate, or shows signs of actual decompensation, are :—

Diuretics and Cardiac Tonics. Among the diuretics may be mentioned caffeine, sodium benzoate, preparations of theobromine, etc. These are particularly applicable in conditions where œdema is present. Salyrgan has been found useful in 1 to 2 c.c. of 1 per cent solution given intravenously. The mercurial and bismuth diuretics are usually best avoided in the therapy of œdema in pregnancy, except where œdema is the result of syphilitic cardiac or syphilitic renal disease.

Diet. In the presence of oedema the water and solid intake should be drastically reduced. The total fluid should not be over 1000 c.c. per diem. In such patients milk, fruit juice, glucose and such nutritious diet without any solids should be administered. A diet of low protein value with a minimum amount of solid preferably saltfree is satisfactory for a few days or even a week.

Digitalis Therapy. This is particularly indicated in cases of decompensation with auricular fibrillation, ventricular tachycardia, or auricular flutter, and in cases of congestive heart failure, especially if the amount of urine is diminished or dropsy is present. It is valuable in all cardiac lesions; and while the drug is likely to prove far more effective when cardiac failure is associated with auricular fibrillation, or auricular flutter with a rapid ventricular rate, it is also of value in cases of rapid ventricular rate with a normal rhythm. It is more useful in mitral than in aortic cases. The object of digitalis therapy is to produce a cumulative effect and thereby obtain its full therapeutic value. To obtain this the drug should be given in greater quantities than it is excreted; and once the objective has been reached the doses should be reduced to the optimum level so that the intake and the excretion may be balanced. There are various methods of pushing digitalis in such cases, but it is better to spread the dose over twenty-four hours and watch the effects of the drug on the pulse and the output of urine. If vomiting is present, digitalis may be administered per rectum or hypodermically. The symptoms of over-dosage of digitalis are anorexia, nausea, vomiting, headache and diarrhoea. The pulse should be carefully watched for any signs of undue slowing, and the heart for evidence of extrasystoles or even of ventricular tachycardia. When evidence of toxic symptoms appear, the drug should be stopped for at least twenty-four hours, after which it may be administered in diminished dosages.

Among other drugs that may be given are strychnine, diffusible stimulants like alcohol, ammonia and ether, camphor-in-oil injected intramuscularly, and such compounds on the market as cardiozal, coramine, cardatone, etc.

Glucose is of value in the treatment of congestive heart failure and should be generously given by mouth. To produce quiet and freedom from excitement or irritability, and to favour sleep, *bromides* are useful. Occasionally *morphia* is indicated for this purpose.

For the dropsy, hypertension and distension of the right side of the heart purgatives are valuable, preferably saline purgatives. The value of diuretics has already been mentioned. In cases of

respiratory embarrassment *oxygen* is of great value, particularly in the presence of cyanosis and dyspnoea. In pulmonary oedema, infarction or hydrothorax it is usually required and should be administered continuously through a nasal catheter or by means of a special mask.

Venesection. In some cases this may be resorted to, but except as an emergency measure it has not proved of much value in cases of decompensation.

Symptomatic treatment for other complications may also be necessary.

Management of Pregnancy. We have deferred to the last the question of the management of pregnancy. When the patient presents herself with a cardiac lesion and pregnancy, the question has to be answered whether she can stand the strain of pregnancy or whether pregnancy should be terminated. In the majority of cases, if the patient's general condition is favourable, and she can be classified under group (1) above, pregnancy may be allowed to progress as long as the patient is under continuous observation. Where the patient is grouped under (2) and (3) above, that is, where signs of decompensation threaten or are already present, the immediate indication is to treat the cardiac condition. No question of terminating pregnancy arises at this stage and, what is far more important, it is dangerous to interfere with pregnancy at a stage when, owing to decompensation, the patient's strength has to be fully conserved. In the majority of cases, with the methods of treatment suggested above, the patient will respond satisfactorily. Once the compensation has been restored the pregnancy may be continued, care being taken to see that, as far as possible, all such factors as are likely to favour decompensation are eliminated.

A problem of greater difficulty arises at this stage. Should decompensation recur in the later weeks of pregnancy, what may be the end-result? In view of this fear it is sometimes permissible to consider whether in the lucid interval, when the general health of the patient is good, steps should not be taken to terminate pregnancy. We are inclined to this view, especially if there has been a history of repeated decompensations before pregnancy and during the earlier period of pregnancy. Such cases always give rise to acute cardiac failure either in the last weeks of pregnancy or at the time of labour. The environment of the patient and the facilities available for prolonged rest in bed and suitable treatment are also to be taken into consideration. If it is decided to terminate pregnancy owing to the possibility of cardiac failure occurring in the later stages of pregnancy, the mode of termination is extremely

important. The best method of termination of pregnancy is by abdominal hysterotomy. If abdominal hysterotomy is performed the opportunity may be taken to sterilise the patient at the same time. The operation can be done under a local anæsthetic, and is generally devoid of risk if performed during the lucid interval. In some cases, however, where pregnancy has not progressed beyond the twelfth week, induction of abortion by the usual methods of cervical dilatation and evacuation may be resorted to.

B. MANAGEMENT OF CASES OF CARDIAC LESION WITH PREGNANCY IN THE SECOND TRIMESTER

During this period the patient, when first seen, may be classified under any of the three groups mentioned above. The same principles of treatment as have already been outlined should be adopted.

So far as pregnancy is concerned, it may be necessary to adopt a more conservative attitude. Not infrequently, if cardiac failure sets in, premature labour may result. In such cases the patient runs a grave risk of collapse after delivery. This will be referred to in dealing with cardiac failure at the time of labour.

If the woman, however, has not started labour, the treatment outlined for decompensation should be adopted and no attempt made to induce labour. In such cases if response is noticed, one is inclined to allow pregnancy to continue in the hope that the woman may be delivered of a live child at or near term.

Should, however, decompensation of varying degrees persist in spite of treatment, the woman runs a grave risk. Under such circumstances the obstetrician may be tempted to terminate pregnancy in the vain hope that some alteration of the condition may result therefrom. Our experience is that such interference is an insult to the damaged and overstrained heart and should therefore never be attempted. In cases, however, where labour occurs spontaneously, the second stage of labour should be assisted as detailed below.

C. MANAGEMENT OF CARDIAC LESIONS IN WOMEN IN THE LAST TRIMESTER OF PREGNANCY

In these cases the important points to be considered are—

- (1) The extent to which the cardiac musculature is able to respond to effort.

(2) Presence or absence of signs and symptoms of cardiac failure.

Besides the hygienic and general measures that should be adopted as already suggested, it is well for the obstetrician to note carefully any anomalies in regard to presentation, position, nature of the pelvis, etc. The management of these cases should be on the same lines as for those under group B. Anomalies of position and presentation should be corrected. Presence of any cephalo-pelvic disproportion must be carefully noted and in such cases, the question of terminating pregnancy by a classical caesarean section preferably in the lucid interval at the peak of improvement will have to be considered.

D. MANAGEMENT OF CARDIAC PATIENTS DURING LABOUR

In cases where the woman is actually in labour it is important to note whether there are any signs of cardiac failure. If decompensation is not present, during the first stage of labour the patient should be at rest and, if necessary, sedatives may be given. Glucose and fruit juice may be given. The bowels should be relieved by enemata.

The second stage is assisted to relieve the strain on the heart imposed by the accessory muscles of labour coming into play. Delivery should be completed with as little strain on the heart as possible. In multiparæ with a history of easy delivery it is permissible to allow nature to proceed and to terminate the second stage as early as possible by artificial assistance, that is, by the application of forceps or version and breech extraction, according to the needs of the case. In primiparæ and in those cases where any abnormalities of presentation, position, or of the pelvis are present, the question of delivery by a lower segment or classical Caesarean section should be seriously considered. The question of the anaesthetic is of paramount importance. A local anaesthetic is to be preferred wherever possible.

Conservation of strength is of great importance. Every care should be taken during delivery to avoid the risks of sepsis. Immediately after delivery collapse may occur; so oxygen inhalations, cardiac stimulants, general stimulants, saline and glucose intravenously must be available. The patient should be given such liquid diet as will supply her with ready energy. Proper management of the third stage of labour is quite important. Dangers of postpartum hæmorrhage should be reckoned with; sud-

den syncope is not uncommon. The patient should be kept on the delivery board for some time and should not be shifted too soon.

Where decompensation is already present the risks of labour are very great indeed. All measures suggested for relief of decompensation should be adopted. Rapid methods of delivery should never be attempted in the presence of decompensation. More harm will result than good by such meddlesome interference. Where there is failure of the right side a mild degree of postpartum hæmorrhage proves beneficial. In some cases, where engorgement of the veins of the neck and congestion of the liver are prominent, venesection may be useful. Delivery may be assisted in the second stage if necessary.

E. MANAGEMENT DURING THE PUERPERIUM

After delivery the patient should be very carefully watched during the puerperium. She must not be allowed to sit up too early and all fatigue should be avoided. The bowels should be kept open; she may be allowed to nurse the baby if her general condition permits it. Prolonged rest in bed for weeks is desirable. A carefully regulated diet, light and nutritious, plenty of fresh air, suitable tonics, hæmatinics and freedom from mental and physical strain are essential for a safe convalescence.

FUTURE PREGNANCIES

As regards future pregnancies the patient should be cautioned about the dangers. If signs of decompensation have been present during the course of pregnancy, every subsequent pregnancy increases the risks to the patient. The fact that the patient has successfully been pulled through one pregnancy does not justify the hope that she may have a similar favourable termination in the next. Even in those cases where no abnormalities have occurred, pregnancy is risky—much more so if it should occur after only a short interval. Perhaps the best treatment, where definite organic lesion associated with cardiac failure has occurred, is sterilisation of the patient after confinement. Where, however, the patient is anxious for another baby, she should be cautioned to have an interval of at least five years.

HEART DISEASE AND MARRIAGE

Should a patient with organic heart disease marry? This question is as often asked of the obstetrician as of the physician;

and the advice to be given will depend upon the circumstances of each case. It is easy to draw a lurid picture of what may happen and to advise against matrimony and motherhood; on the other hand, human instincts and human tendencies must be considered, and no such easy method of escape is possible for the obstetrician who wishes conscientiously to discharge his duties. In coming to a judgment the factors to be taken into consideration are the ætiology of the cardiac lesion, the nature of the lesion and whether it is quiescent, active or progressive; the reaction to effort under present circumstances, and the adequacy of the reserve force. The patient should be given frankly the opinion as to how far pregnancy may shorten her span of life or render her more liable to serious risks. In cases where the heart lesion is marked and congestive failure has been present, it is rational to prohibit child-bearing. Even in other cases the risks of pregnancy and labour should be fully explained and the final decision left to the person concerned.

It is common to advocate contraception in these days for such cases. Without entering into any controversial discussions as to the value and the place of contraception in diseased conditions, it is pertinent to observe that contraception is not a wise method in cases of heart disease. The strain, the anxiety and the probable failure all throw such a heavy burden upon the young woman that while she may escape one danger she will probably fall into another.

Occasionally in such cases sterilisation has been suggested, so that the dangers of motherhood at least are no longer present. All factors must be considered before giving definite advice in an individual case, and no hard-and-fast rules can possibly be laid down.

CHAPTER XVIII

DISEASES OF THE RESPIRATORY SYSTEM COMPLICATING PREGNANCY

Tuberculosis of the Lungs

By far the commonest form of tuberculosis that may be met with in women of the child-bearing period is tuberculosis of the lungs. Occasionally one meets with cases of tuberculosis of the glands or of the bones complicating pregnancy. Not infrequently an old tubercular caries of the spine which has healed up may be met with,

giving rise to complications in labour owing to the associated pelvic deformity. Rarely abdominal tuberculosis and pregnancy co-exist.

That pulmonary tuberculosis has a very deleterious influence upon progeny is becoming more and more well recognised. The question is often asked whether in the presence of tuberculosis marriage is desirable. The answer is obvious. A woman with tuberculosis is likely to suffer in a more aggravated form from the effects of the disease during pregnancy or immediately after delivery; secondly, the children are likely to be predisposed to tuberculosis and the danger of infection is very great in the family. If, however, the disease has been controlled and an interval of two to three years of complete quiescence has been noted, marriage may perhaps be permitted. Taking all factors into consideration it is unnecessary to prohibit marriage; but when such marriage has been permitted the married couple should be advised strongly as to the necessity for prudence and care. All excesses should be avoided. It is desirable that for a year or two after marriage, conception is prevented. This will give time for the patient to get adjusted to the new mode of life. If the strain is not attended with any exacerbation of the old focus, the possibilities are that the woman may go through pregnancy and be delivered without much added risk. It should, however, be realised that an old healed up tuberculosis may at any time give rise to a recrudescence of the trouble, and this is most favoured if there be frequent child-births. The need for spacing of pregnancy is greater in the tuberculous woman than in others; and it cannot be sufficiently emphasised that if marriage be permitted in healed up cases of tuberculosis there is necessarily a limitation as to progeny.

So far as women with open tuberculosis are concerned, there is no doubt that marriage should be discouraged. If signs of active tuberculosis are found in a woman who has already married, every care should be taken to see that she does not risk conception. In some cases it may even be necessary to suggest sterilisation as the only safe method of preventing conception.

INFLUENCE OF PREGNANCY ON TUBERCULOSIS

There is still a great deal of difference of opinion among obstetricians and physicians as to the effect of pregnancy on tuberculosis. While one group believes that pregnancy very definitely aggravates tuberculosis, another group is of opinion that tubercu-

losis is probably benefited by pregnancy, while a small number believe that it has no effect whatsoever on the progress of the disease. Obviously much depends upon the tubercular focus and whether it is quiescent or active.

The worst period in pregnancy for a tubercular patient is the first trimester, when the incidental complications such as morning sickness, nausea, etc., undermine the strength of the patient to such an extent that a latent infection may become active, or an active lesion may get aggravated.

During the second trimester this tendency is not so marked, while in the last months of pregnancy generally there is an apparent improvement. This may be due to the fact that the growing uterus gradually presses upwards, particularly between the thirty-second and fortieth weeks, and produces a condition similar to artificial pneumothorax. It may be that this, associated with the general care of the pregnant mother at this stage, is responsible for what appears to be an improvement in her general health.

Whatever may be the effect of tuberculosis on pregnancy, there is no doubt that during the puerperium the disease generally tends to manifest itself in a very aggravated form. Why exactly this should occur is not very clear. It has been suggested that the sudden emptying of the uterus and the consequent release of pressure may produce a favourable condition for the dissemination of the tubercle bacilli. Clinical experience makes it clear that the time which is to be most dreaded in cases of tuberculous women is during the puerperium and not so much during pregnancy.

EFFECT OF TUBERCULOSIS ON PREGNANCY

Tuberculosis does not effect fertility except in those cases where the disease is in an advanced condition or in cases of tuberculosis of the genital tract or of the adnexa. Pregnancy is not interfered with and usually the child is well developed. Cases have been recorded where tuberculosis has been transmitted to the foetus *in utero*, but the greater danger is the possibility of infection of the new-born from the mother by close contact and association.

TREATMENT OF TUBERCULOSIS

We have already referred to the question of marriage and conception in women with tuberculosis. It has been suggested that a woman with active tuberculosis should not marry, and marriage is permissible only if the infection has been quiescent

for at least three years. Even in such cases it is not advisable that conception should take place for some time after marriage, and even later, the pregnancies should be spaced out so that frequent child-bearing is avoided.

When, however, pregnancy does take place the patient should be under constant care. Occasionally the woman may present herself with tuberculosis complicating pregnancy during the first trimester. The question that has been prominently raised is whether pregnancy should be terminated in such cases. At one time opinion was widely prevalent that termination of pregnancy was the safest course to adopt. Experience has, however, shown that such an extreme view is not tenable; that in the large majority of cases the woman may be taken through the whole course of pregnancy and be safely delivered, and that on the other hand the termination of pregnancy does not necessarily ensure safety for the mother. With the modern methods that are now available for the treatment of this condition there does not seem to be much justification for termination of pregnancy in this condition. If, however, there be evidence of active tuberculosis early in pregnancy and the patient is suffering from fever, wasting, laryngeal tuberculosis or hæmoptysis, the pregnancy should be terminated. Similarly, when other complications such as nephritis, heart disease etc., are present in a tubercular woman, termination of pregnancy would appear to be the safer course.

When it is decided that pregnancy should be terminated, the question arises as to the mode of termination. The old method of inducing abortion and completing the evacuation of the uterus at two sittings does not appear to be a satisfactory method. Abdominal hysterotomy and evacuation of the uterus, with sterilisation if necessary, would appear to be far safer, particularly if the pregnancy has advanced beyond twelve weeks. In cases where pregnancy is allowed to continue, care should be taken to see that the patient is kept in the best of surroundings, that the diet is regulated and that suitable measures are taken to treat any other symptoms that may arise. Sanatorium treatment, artificial pneumothorax and medicinal measures should be adopted. Codliver oil, particularly valuable on account of its fat soluble vitamin A content, creosote, hypophosphites, nascent iodine, calcium, may all be used. It is not possible during pregnancy to attempt any of the major operative measures, such as thoracoplasty, apicolysis or evulsion of the the phrenic nerve. Artificial pneumothorax may sometimes be performed in the early weeks of pregnancy, and is most desirable

during the puerperium for reasons to be mentioned later. Together with these, symptomatic treatment to alleviate the cough, fever, night sweats or hæmoptysis and the gastro-intestinal symptoms may be necessary. If the patient should present herself in the 2nd or 3rd trimester of pregnancy with or without active signs of the disease, the treatment should be on the same lines as already indicated and the pregnancy should not be terminated.

COLLAPSE THERAPY

Collapse therapy has definitely minimized the risk of exacerbation of Tuberculosis either in the early months of pregnancy or within the first few months following delivery and has brought a better outlook to the expectant tuberculous mother. It has restored to her the right of motherhood. Each case however, must be carefully evaluated on its own merits, including physiological and social factors, as well as pathological, before a decision is taken for or against pregnancy.

If the disease, though advanced is limited to one lung (as indicated by X-ray study), the diseased area is anatomically well collapsed, the sputum free of tubercle bacilli, and the collapse maintained throughout pregnancy, there is little or no risk of reactivating the tuberculosis and one or more pregnancies may safely be undertaken. This is true also if there is advanced tuberculosis in both lungs, but with the disease in each lung controlled with adequate collapse therapy. Pneumothorax therapy may be considered as an alternative to therapeutic abortion in the presence of active tuberculosis first recognised during the early months of pregnancy. When the collapse is good and promptly controls the tuberculosis, the woman may safely proceed to term.

Only collapse therapy which produces adequate localised collapse of the diseased portion of the lung, such as pneumothorax, maintenance oleothorax, or thoracoplasty, will prevent reactivation of the disease. Indirect collapse, such as phrenic-nerve interruption, is not enough. Inadequate collapse therapy where there is inability to close cavities and render the sputum free of tuberculosis is of no value so far as the effect of pregnancy on the tuberculosis is concerned.

MANAGEMENT OF LABOUR

During labour the patient is not in a position to stand the strain to any great extent. As soon as dilatation of the cervix is complete and the greatest diameter of the head has passed through

the brim of the pelvis, it is desirable to help delivery by forceps. Every effort should be taken to see that excessive hæmorrhage in the third stage is controlled, if not prevented.

THE CARE OF THE PUERPERIUM

This is perhaps the most anxious time in a tuberculous woman. We have already referred to the fact that at this stage there is a tendency for an exacerbation of the disease. Lactation should be strictly forbidden, the child should be removed and separately nursed; great care should be taken to see that there is little or no risk of puerperal infection; and it is at this stage that we recommend artificial pneumothorax. It has already been stated that while in the later weeks of pregnancy the enlargement of the uterus presses upon the diaphragm and produces a condition of collapse of the lung similar to artificial pneumothorax, when delivery has taken place and the pressure thus relieved, it would appear to favour an exacerbation of the disease. We therefore recommend that at this stage artificial pneumothorax would be a useful method of keeping up the intrathoracic pressure, with a view to favour a partially collapsed state of the lungs. The patient should be advised to take particular care for at least six months after delivery, and thereafter she should lead a well-regulated life and should avoid all possibilities of conception for some years; the minimum is three, preferably five years, and the number of offspring should be limited to two or three.

So far as the child is concerned there can be no doubt that it is safest not to allow the mother to nurse it. This advice is necessary for two reasons: first, lactation has got a prejudicial effect upon the recovery of the patient; and secondly, whatever may be the apparent state of health, a tuberculous mother may infect her offspring by close proximity, and therefore not only should nursing be forbidden but the mother should be restrained from having her child too near her. If sufficient care is taken, there is no reason why the child should not escape tubercular infection.

Lobar Pneumonia

This condition, when it occurs in pregnancy, is likely to lead to interruption of pregnancy. The two factors which may bring this about are the high elevation of temperature and the comparative anoxæmia that sets in.

The effect of temperature on the foetus has already been detailed in the introduction to this chapter.

So far as respiratory diseases are concerned, it may be stated that where cyanosis is marked during the course of the disease, premature delivery is very liable to occur. In cases of lobar pneumonia, the enlarged pregnant uterus restricts the movement of the diaphragm, so that there is greater dyspnoea and cyanosis. The strain on the heart is likewise increased, so that cardiac failure may occur earlier and in a greater percentage of cases than in the non-gravid condition. Abortion or premature labour, therefore, occurs more frequently in this condition. The condition of the mother is further aggravated by the strain due to labour, thus diminishing the chances of recovery. In nearly 50 per cent of the cases pregnancy is interrupted spontaneously, more frequently in the later months. The mortality is therefore considerably increased.

The effect on the foetus is also very grave. If of viable age and born alive it may die soon afterwards, either from the infection itself *in utero* or from other causes associated with the onset of premature labour.

There is a possibility of puerperal infection due to the pneumococcus.

Treatment. It is obvious from what has been stated above that during pregnancy every care should be taken to avoid exposure to conditions which are likely to lead to respiratory troubles, and particularly to pneumonia. When there is any respiratory trouble during pregnancy particular care should be taken to see that the patient is at once put to bed and watched. The disease should be treated along the usual lines adopted in the non-gravid condition. Drugs should be used only for definite indications. Care should be taken to examine the heart frequently and to support its activity by the judicious use of cardiac stimulants. Cyanosis may be relieved by inhalation of oxygen. In recent years specific therapy for pneumonia has been advocated and the use of sulpho-pyridine and sulpho-thiozole have reduced the mortality in a striking manner. The use of Penicillin has further revolutionised the treatment of this condition.

So far as the management of pregnancy is concerned, interruption is detrimental to both mother and child. If labour sets in, efforts should be made to hasten the delivery in the second stage and thus lessen the strain on the maternal heart. The application of forceps in suitable cases, or extraction of the foetus, is desirable. Circulatory failure may be precipitated by the rapid fall in the blood pressure following labour. Intravenous administration of digitalis or strophanthus may be necessary.

During the puerperium and in the convalescent period the patient should have a nourishing diet and a fairly long rest, the condition of the heart being carefully noted.

Acute Infectious Diseases

The pregnant woman is just as susceptible, or perhaps even more so than the non-pregnant, to any of the acute infectious diseases prevalent in the locality. The disease is generally aggravated by pregnancy and has in its turn a deleterious effect upon pregnancy. Abortion or premature labour is not infrequent and the condition may become worse after such termination of pregnancy. We shall refer to a few of the salient points connected with some of the important infectious diseases that may occur in pregnancy. The general symptomatology, diagnosis, prognosis and the methods of treatment may be gleaned from text-books on Medicine.

Among the common acute infectious diseases met with in pregnancy are influenza, typhoid, smallpox, chicken-pox, scarlet fever, measles and diphtheria. In most of these cases the sudden variations in temperature, the severe toxæmia, the associated damage to the heart and the kidneys, and the tendency to hæmorrhage have all an adverse effect upon pregnancy.

Their effect upon the foetus is also deleterious. The part played by high ranges of the maternal temperature on the foetus has already been detailed. Intra-uterine death of the foetus is not uncommon. The high toxic condition of the mother has also a very damaging effect upon the foetus. The premature termination of pregnancy means almost certain foetal death. Foetal asphyxia may also occur *in utero* from various causes—from the low blood pressure, from the profuse hæmorrhage that the mother may have and from degenerative changes. The child may also acquire the disease from the mother as the toxins may pass through the placental barrier, and in some cases even the bacteria. Thus, in cases like smallpox, measles, scarlatina, typhoid, etc., the infection has been noted in the foetus.

INFLUENZA

Perhaps, one of the most serious of complications in pregnancy is influenza. This has been made evident in recent epidemics by the large toll of both maternal and infantile deaths associated with the severer forms of this disease, particularly when it affects the respiratory tract. Owing to the high rise of temperature and

the respiratory embarrassment that occurs when the lungs are involved, abortion in the early months is very frequent. In the later months premature labour is not infrequent. The labour terminates quickly. This may be due to the increased force of uterine contractions brought about by the increased carbon dioxide content in the maternal blood.

A pregnant woman has an increased susceptibility to influenza and a higher mortality rate occurs in them than in other groups. In mild forms of influenza not much damage may be done to the mother or the offspring, although in the majority of cases the mother is rendered so weak that if labour occurs soon after, it increases the risks incidental to labour and puerperium. Susceptibility to puerperal sepsis is greater in those who have recently suffered from influenza, particularly if the respiratory tract has been involved.

Prognosis. So long as symptoms of influenza are mild there is no grave danger to the mother. In cases, however, where lung complications set in, the mortality is very much greater. Increased tendency to abortion and premature labour has already been mentioned. The foetal mortality is very high on account of the prematurity and the toxic condition of the mother. Even after birth, the new-born child is liable to influenza and the mortality is great.

Treatment. The chief object to be kept in view is to prevent the possibility of infection. If influenza does develop, care should be taken to see, if possible, that pneumonia does not set in. During an epidemic the expectant mother should be segregated and allowed to sleep separately with provision for plenty of fresh air. No one who has attended a case of influenza should attend on her.

On the occurrence of early signs of influenza the patient should be put to bed immediately in a well-ventilated room with plenty of fresh air. Besides the ordinary treatment adopted for the condition, general stimulant treatment is desirable from the beginning. In lung complications such as pneumonia, etc., oxygen inhalations are beneficial. Oedema of the lungs sets in quite abruptly and requires prompt measures. Venesection may be necessary. Intravenous injections of strophanthin or some preparation of digitalis may be indicated for the cardiac embarrassment and failure. When a patient has had an attack of simple influenza she should be encouraged to take rest for seven to ten days after the temperature becomes normal. Light nutritious diet and careful nursing are required at this period. Neglect on the

part of the mother may bring about a severe recurrence of the infection.

If the woman is in labour, help may be given to relieve the strain of the second stage by the application of forceps. On the other hand, in a large number of cases labour tends to be precipitate. It is inadvisable to induce labour in a woman suffering from infection.

During the puerperium the patient should be particularly looked after, as with the great amount of debility that results after an attack, any slight exertion may end in a fatal attack of cardiac failure or embolism.

TYPHOID

Prevalent everywhere, it is much more so in the tropics, owing to the deplorable hygienic conditions in the large majority of cities and rural areas. It is a serious complication of pregnancy. Abortion or premature labour occurs in a large number of cases. In the later months of pregnancy the foetus may be born still or may die in the neonatal period. The disease gives rise to a slightly higher mortality in the pregnant than in the non-gravid patients.

Not infrequently typhoid occurs during the puerperium, when the differential diagnosis between puerperal infection and this condition may present difficulties. A large number of these cases are still mistaken and treated as puerperal infection, when a careful examination of the patient, correct observation of the pulse, the gradual rise of the temperature, the characteristic mental and physical condition of the patient, the enlargement of the spleen and the nature of the stools would serve to differentiate the two conditions. The blood should always be examined for the Widal reaction. In many cases, it is desirable to have a blood culture done. In rare cases, puerperal infection may be caused by the typhoid bacillus.

The treatment should be along the usual lines adopted for this condition. It is not desirable to terminate pregnancy under any circumstances. Prophylactic vaccination against typhoid may be done when an epidemic is prevalent. In the puerperium, it is advisable to remove the child from the mother and forbid breast-feeding.

VARIOLA

This disease has got a very adverse effect upon pregnancy and generally causes abortion or premature labour. The severer forms

of the disease, like confluent smallpox and the hæmorrhagic varieties, are particularly fatal in pregnant women. Should smallpox develop during the later months of pregnancy there are several possible terminations, depending largely upon the severity of the attack. The infant may acquire the disease *in utero* and be born at term with slight evidence of the infection on the skin. On the other hand, the child may be born with the eruptions fully developed or the rash may appear some days after birth. These terminations depend no doubt upon the stage of the disease at the time of delivery. It may generally be presumed that smallpox is transmitted from the pregnant mother to the foetus *in utero*. But there are exceptions to this rule.

The treatment of this disease in the gravid condition differs little from the treatment of smallpox at other times, except that all precautions should be taken to avoid premature labour, as labour at the time when the infection is active will be an additional strain.

Occasionally, when the child is born during the eruptive stage of the disease, the question arises as to what precautions should be taken to see that it does not develop smallpox. Isolation is absolutely necessary, and it may be well to vaccinate the new-born child in the hope that the vaccinia will take effect before the possible occurrence of smallpox and thus mitigate its severity.

During an epidemic of smallpox in the community, pregnant women should be vaccinated. It is possible that the protective influence of vaccination is also transmitted to the foetus. It is most desirable if the mother has not been vaccinated, to vaccinate the child soon after birth when an epidemic is prevalent in the locality. Children are more likely to develop the disease than the mothers, and every step should be taken to protect the new-born children by vaccination. There is no contra-indication to vaccinating them within the first week after birth.

SCARLET FEVER

This disease is very rare in tropical countries. Even in those countries where it is prevalent it is generally believed that pregnant women seldom get real scarlatina. On the other hand, there seems to be good ground for the opinion that scarlet fever contracted during the puerperium, is serious. Care must, however, be taken to differentiate various scarlatinal forms of eruptions that may appear during the puerperium from true scarlet fever.

Rigid isolation is essential. Care is also necessary to see that the streptococci from the nose or throat do not find their way

to the genital tract. In the puerperium, energetic treatment is required.

The question of giving an antitoxin should be considered with due reference to the possibilities of serum reaction.

Treatment on the usual lines adopted for scarlet fever should be followed and the patient's general health maintained.

MEASLES

Measles not infrequently complicates pregnancy, and owing to the nature of the sudden elevation of temperature causes abortion or miscarriage or premature delivery.

The prognosis in this condition is much more serious in the puerperium than during pregnancy. The mortality is fairly high, due to the occurrence of puerperal infection. Strict isolation is essential, and every care should be taken to see that the discharges from the upper respiratory passages are not allowed to infect the genital tract.

DIPHTHERIA

This is a very rare complication of pregnancy or the puerperium. Cases have been reported in the literature of true diphtheritic infection of the genital tract. The disease should be treated along the usual lines adopted for diphtheria. Extreme prostration is not infrequent after delivery and supporting treatment is essential.

CHICKEN-POX

This is not a rare complication of pregnancy, particularly in the tropics. Usually, however, it does not cause any serious complications either in pregnancy or puerperium. Care must be taken to see that there is no error in diagnosis, as occasionally the severer forms of chicken-pox, such as varicella gangrenosa or hæmorrhagica or bullosa may, when first seen, lead to errors in diagnosis. In these severer forms pregnancy is usually interrupted and the prognosis is grave.

The differential diagnosis between smallpox and chicken-pox is of primary importance. The day of the occurrence of the rash, its distribution, the nature of the temperature and the duration of the rash will help in coming to a diagnosis.

Absolute rest in bed, light diet during the febrile stage, and stimulant treatment later are indicated. Pregnancy should not be interrupted artificially.

RELAPSING FEVER

This is a specific infectious disease due to a prevalent in several parts of Europe and in India and other tropical countries. During an epidemic, people are liable to contract the disease easily. In India the most commonly noted resembles the relapsing fever. Rigors are not so common; collapse is more frequent. While relapses are common, in some cases non-relapses also occur. The disease may last from twelve to twenty days and is associated with severe pain in the back and nausea or vomiting, loss of appetite, a dry tongue and constipation is usual; jaundice may occur in a fair proportion and sometimes bronchitis and broncho-pneumonia complicate the condition.

On microscopical examination of the blood usually present in large numbers during the fever is an increase of leucocytes, particularly of the polymorphous variety. The urine is scanty and may contain granular or hyaline casts.

Diagnosis. The nature of the outbreak, the temperature chart and the occurrence of spirochetes help in the diagnosis. Dengue, malaria and typhoid diseases most likely to give rise to errors in diagnosis. A careful hæmatological examination should be made, but is difficult, except in those rare cases where it is present in the blood film, even during the febrile stage.

Prognosis. The mortality in different epidemics the average being 10 to 15 per cent. It is more common in women than in the non-gravid. In the majority of cases miscarriage or premature labour is the rule. If a relapse of pregnancy occurs, it usually happens either during the fever or during a crisis leading to a severe complication. The prospects of recovery depend on the severity of the disease, the general health of the patient and the promptness of the treatment adopted.

Treatment.—Preventive. It is known that the disease is due, particularly in the Asiatic type, to the louse, the carrier, and in the presence of epidemics the isolated and all contacts must be freed from louse infestation and unhygienic surroundings with a great deal of care. Proper methods of isolation or disinfection cannot

necessary to see that the hair is completely shaved off the head to avoid possibilities of the infected lice spreading from person to person. In other cases the hair should be cut short and a cloth soaked in kerosene oil, or an equal quantity of kerosene and mustard oil, should be applied close to the scalp to kill all the lice and their eggs.

Curative. Complete rest in bed is essential during the attack and the convalescent stage. The great danger is heart failure, and this is most likely to occur at the time of the crisis. The diet should be liquid, light and nutritious.

The most useful specific treatment consists in the administration of one of the arsenical preparations—neosalvarsan, novarsenobillon, sulpharsenol, etc.—being given preferably by the intramuscular route. The time to give the drug is soon after the onset of the fever, or at the height of a paroxysm, when the spirochaetes are still numerous in the blood stream. The dose of the drug should be carefully regulated as pregnant women, particularly in tropical countries, do not stand the large doses usually recommended—a third to a half of the adult dosage being quite sufficient for this purpose.

Intra-uterine death of the foetus is not unlikely even in cases where pregnancy is not interrupted.

For the complications such as bronchial catarrh, hæmatæmiesis or hæmaturia, suitable treatment should be adopted. The collapse stage should be carefully watched and stimulants like digitalis, strychnine, coramine, camphor-in-oil administered.

Specific Diseases

SYPHILIS

This is one of the diseases affecting pregnancy, which shows its effects not merely on the mother but also on the offspring, and in some cases transmits its adverse effects even to the third generation. Syphilis is responsible for a large number of miscarriages and still-births; it is also responsible for a good percentage of neonatal mortality. The majority of macerated foetuses are the result of syphilitic infection. It must, however, be stated that syphilis plays a much less important part in the causation of abortion. In fact, repeated abortions occurring more or less at the same period of pregnancy are not generally due to syphilis.

Effect of Syphilis on Pregnancy. The effect of this disease on pregnancy depends upon several factors. Among these may be mentioned:—

(1) Time of infection—

- (a) Before pregnancy.
- (b) At the time of conception.
- (c) During the first half of pregnancy.
- (d) During the last weeks of pregnancy.

(2) Antisyphilitic treatment adopted—

- (a) Before conception.
- (b) During pregnancy. The period at which treatment was started.

In general, it may be stated that women who are syphilitic are sometimes sterile. If the infection occurred at a remote date and careful treatment was adopted, there is no reason why the woman should not give birth to healthy children. In those cases where treatment has not been adopted, the effect on pregnancy depends upon the period at which the infection took place. If the infection is recent, the foetus generally dies and miscarriage results; but with each successive pregnancy the termination of pregnancy takes place at a later date, so that a record may be obtained of miscarriage, premature birth of a macerated foetus, still-birth at full term, and a live birth of a foetus showing later the stigmata of syphilis; later still, the children may be born apparently healthy and show the manifestations of syphilis at varying periods after birth, in some cases after several years. In such cases the manifestations are those of neuro-syphilis.

If treatment be vigorously adopted at any stage, this course of events may be controlled, and it is possible to ensure that the woman is delivered of a healthy child; or if treatment has been adopted somewhat late in pregnancy, that she is delivered of a live child which, if properly treated, may overcome the manifestations of the disease. Many deformities such as hydrocephalus, anencephalus, spina bifida, etc., may be due to syphilis.

When the syphilitic infection occurs simultaneously with conception, the invariable rule is miscarriage. When, however, infection occurs during pregnancy, the effect on the foetus will depend upon the period of gestation at which infection occurred. If it occurred in the early periods of pregnancy, in the first trimester, or a little later, the possibilities are that the child may die and the woman be then delivered of a macerated foetus some-

where between the twenty-eighth and thirty-fourth week. On the other hand, if the infection were to take place in the last weeks of pregnancy the child may escape, but if care be not taken later, it may be infected by the mother.

Effect of Pregnancy on Syphilis. In most cases it would appear that syphilis runs a mild course during pregnancy, but some of the secondary manifestations such as condylomata and skin rashes may appear in an aggravated form, probably because of the increased vascularity.

Treatment. The adverse effect of syphilis upon the foetus is so great that it is now an invariable rule in all antenatal clinics, irrespective of any previous history or otherwise, to do the routine serological tests, Wassermann and Kahn, in every case. It is surprising how in some cases with no evidence of syphilitic infection and no history, these tests prove the presence of infection.

In every case where the diagnosis of syphilis is made, treatment should be started immediately and must be done thoroughly. Pregnancy is no bar to the proper treatment of syphilis in the mother. On the other hand, the possibilities of carrying pregnancy to full term are much greater if a thorough and radical method of treatment is adopted.

It is unnecessary to go into the details of the method of treatment to be adopted for syphilis, as such details are found in treatises dealing with this particular condition.

The treatment should be persisted in till the Wassermann reaction is negative for at least one year. It is not sufficient to treat the mother, as in a large number of cases the treatment might have been started at such a late stage that complete cure for the child cannot be guaranteed. The child may be apparently normal at birth but may show the manifestations of syphilis at a later stage. For this reason, it is necessary that the child should also be treated. Simultaneously with the treatment of the mother, it is desirable that the other parent should also be subjected to treatment. Along with the usual measures, such as injections of salvarsan, bismuth, etc., it is well to treat the patient for the accompanying anaemia. Iron and arsenic may be given in suitable doses. In view of the fact that the kidneys are always subject to damage during pregnancy from various causes, the urine should be carefully examined from time to time, and if there is any suggestion of damage, suitable treatment should be adopted.

Patients receiving therapy, both prior to and during pregnancy have almost a 100 per cent chance of having a non-syphilitic

infant. All patients with a history of syphilis should be treated during each pregnancy without consideration of serological reactions or amount of previous therapy. Serological reactions during pregnancy present a degree of inconsistency. When weak reactions are repeatedly observed, therapy should be instituted, especially if a history is obtained of still-births or abortions or suspicious lesions or positive reaction in husband. There is increasing evidence that pregnant women are more susceptible to the bad, as well as to the good effects of Arsenical therapy and furthermore, that fatalities though rare, are particularly prone to occur when treatment is initiated late in gestation. In an effort to obviate the necessity for intensive antisypilitic therapy, during the last weeks of the antepartum period, early antepartum registration is urged, so that arsenical treatment may be started when it is least dangerous and when it will do most good.

So far as the child is concerned, the mother can suckle the infant though it may show manifestations of syphilis. A syphilitic infant stands in greater need of mother's milk than a healthy infant. On the other hand, "wet nursing" should never be adopted, as there is great danger of the infant infecting the nurse.

GONORRHOEA

Gonorrhœa is not infrequent in pregnant women, the infection occurring either prior or subsequent to conception. Pregnancy would appear to favour exacerbation and extension of the infection. Gonorrhœa exerts a definitely adverse influence upon the pregnant woman and may cause abortion, miscarriage, premature labour and puerperal infection. In cases where the infection has been of some standing and the tubes are affected, sterility may result. If the tubes are not affected, women with gonorrhœal infection not infrequently, become pregnant. The cervix, more than any other part of the genital tract, is the site at which gonorrhœal infection persists longest. The primary site of infection in 95 per cent. of the cases is either the cervix or the urethra. A vaginitis is much rare. Complications, such as gonorrhœal arthritis and gonorrhœal endocarditis are noted more often during pregnancy and peritonitis during the puerperium. The chief period when gonorrhœa in a pregnant woman shows its most adverse effect is in the puerperium. At this time, because of the dilatation of the passages, the bruising of the tissues and the opening up of large venous spaces, the infection that has been limited to the cervical canal or the urethra or the ducts of the

vulvo-vaginal and urethral glands rapidly spreads to the uterine cavity, thereafter gaining admission through the tubes into the peritoneal cavity, and thus a severe form of puerperal infection may result.

If the presence of gonorrhoea in pregnancy has been diagnosed, every effort should be made to see that the condition is treated before delivery. Vaginal douches of weak solutions of potassium permanganate may be given twice a day, care being taken that the irrigations are given slowly and that no force is exerted. Vaginal suppositories containing 1 to 1.5 per cent. of mercurochrome may be inserted daily, or an ounce or two of the aqueous solution of mercurochrome may be instilled into the vaginal cavity. It is hazardous to attempt any intracervical examinations or therapy in an acute infection. The patient should be kept in bed, antiseptic hip-baths given and diuretics and urinary sedatives administered.

Particular care must be taken in the conduct of labour. The parts should be shaved, the external genitalia thoroughly cleaned, the adjacent structures painted with a 5 per cent. tincture iodine solution and the vagina swabbed with 1 per cent. solution of mercurochrome. All vaginal examinations and the use of instruments should be avoided unless absolutely necessary. If the patient be in labour for a long time, the vagina should once more be swabbed with an aqueous solution of mercurochrome. If operative delivery becomes absolutely essential, a copious vaginal douche with a weak solution of potassium permanganate should be given without force and with the patient in the recumbent position with the head and trunk elevated. It is most dangerous to attempt any intra-uterine manipulation in women who have had gonorrhoeal infection. The placenta should always be delivered by expression after the method of Credé.

During the puerperium, firm retraction of the uterus and free drainage should be favoured. Immediate repair of lacerations is advisable. Postpartum douching or intracervical examinations are contra-indicated and the patient had better be kept in Fowler's position for about ten days.

Occasionally, exacerbation of a latent infection of gonorrhoea occurs after labour, due to lacerations which result in the setting free of gonococci hitherto encapsuled in the glands and causes an elevation of temperature. The puerperium should be carefully watched for signs of any peritonitic infection.

The treatment of gonorrhoea has been radically altered in recent years. The response to chemotherapy is dramatic; all clinical symptoms of discharge, external irritation and inflammation subside rapidly, and smears and cultures become negative after 24 hours of treatment.

Few toxic reactions, such as gastro-intestinal symptoms, skin eruptions, fever, and anaemia, may occur with sulfanilamide and sulfapyridine, but none will be encountered in patients treated with sulfathiazole. Sulfathiazole and sulfadiazine are the drugs of choice for treatment of women.

The dose of sulfathiazole may be 1 gramme four times a day for five consecutive days. The precautions suggested in the treatment with the sulfa drugs in a later chapter should be observed. A single course of 20 to 28 grammes will be sufficient in most cases.

If the patient is not rendered non-infectious by such a short intensive course of chemotherapy, nothing is gained by prolonging such medication or returning to it in the event of a relapse. In such cases local, focal, surgical and fever therapy have all a place. Fever therapy, however, is unsuitable during pregnancy. Estrogen therapy is a remarkable advance in treatment of vulvovaginites, but it does not cure all cases. It is of greater value in the vulvovaginitis of infants. Estrogens applied locally in the form of vaginal suppositories (0.1 mg. Diethylstilbestrol) yield better results in the treatment than estrogens given orally or hypodermically.

The use of Penicillin in the treatment of gonococcal infections has revealed the fact that it is particularly valuable in the treatment of sulfonamide-resistant gonorrhoea.

Care of the Child. Gonorrhoeal conjunctivitis is the chief danger that threatens the infant, the eyes being infected during its passage through the birth canal. To prevent the occurrence of ophthalmia neonatorum, prophylactic treatment should be adopted. As soon as the head is born, the eyes should be wiped with absorbent cotton moistened with boric acid solution, 10 grains to 1 oz. This should be followed as quickly as possible by a thorough irrigation of the eyes with a similar solution, after which 2 drops of a freshly prepared 1 per cent. solution of silver nitrate should be instilled into each eye, making sure that the solution falls into the eye and not upon the lids, and that it is well distributed.

To prevent late infection in the puerperium the mother should be warned of the infectious nature of the discharge and the offspring should not be permitted to occupy the same bed as the infected mother. Should gonorrhoeal ophthalmia develop, it is better to place the infant under the care of a competent ophthalmologist. The eye should be carefully irrigated with a 10 per cent. boric acid solution and silver nitrate solution, 1 per cent., instilled two or three times a day. The sound eye should be suitably protected.

GRANULOMA INGUINALE (INFECTIVE GRANULOMA)

This condition is widely prevalent in different parts of India and in several of the tropical countries, and occurs sporadically more particularly in Madras and neighbouring districts. The disease commences in most cases on the genitals, usually on the labia minora or the groin in women, and advances either by continuous eccentric peripheral extension or by auto-infection of the opposing surfaces. Its extension is very slow and it gradually covers a large area.

The importance of this condition is due to the fact that it is not infrequently noted in women who are pregnant. The obvious risks involved in an ulcerating growth spreading over the labia and surrounding parts at the time of labour, or even during the course of pregnancy, make it necessary that early treatment should be adopted. This condition should be differentiated from malignant and syphilitic ulceration about the labia and groin, which may also be found in pregnant women. It differs from these clinically, histologically and therapeutically. The chief characteristics are:—

- (1) Its extreme chronicity.
- (2) Absence of any cachexia.
- (3) Non-implication of the lymphatic system.
- (4) Failure of response to treatment with mercury or iodide of potassium or the usual anti-syphilitic remedies.

Unless there is a coincident syphilitic infection the Wassermann test is negative. Its characteristic mode of spread suffices to distinguish it from epithelioma. Biopsy will clinch the diagnosis.

Treatment. Modern treatment consists in intravenous injections of tartar emetic, which is a specific. A prolonged course of this drug is necessary—the total dosage being about 50 to 60 grains.

Among the preparations that are now available in the market are Fouadin (from 0.5 to 5 c.c.), Ureastibamine and allied preparations. In pregnant women, if the treatment is started sufficiently early, the condition may heal before labour sets in. If, however, the ulcerating condition persists, precautions have to be taken to see that infection does not spread into the genital tract at the time of labour. Vaginal examinations are therefore contra-indicated, and as far as possible delivery should be left to natural efforts. It would at first appear safer to resort to delivery by the abdominal route, where an ulcerating granulomatous condition of the genitals is present, with the characteristic discharge. Our own experience of several cases has been that in spite of the theoretical considerations, labour has ended naturally and no septic complications have ever arisen. In view of this experience we doubt whether it would be necessary at any time to resort to abdominal delivery, unless there be indications which suggest the need for active interference. In cases with extreme scarring consequent upon a healed ulcerative granuloma, the narrowing of the vaginal outlet offers a serious impediment to the course of labour. In such cases it may be necessary to resort to an abdominal route delivery, as otherwise the lacerations and the delay in labour may seriously affect both mother and child adversely.

CHAPTER XIX

TROPICAL DISEASES

Malaria

THE widespread distribution of malaria, especially in tropical countries, makes it a not infrequent complication of pregnancy. The effect of malaria on pregnancy can be gauged from the fact that during an epidemic of malaria, there is usually a sharp fall in the live birth-rate and an increase in the infantile mortality rate. The fall in the live birth-rate is due to the occurrence of abortion, premature labour and still-births. Benign forms of malaria may not affect the course of pregnancy to the same extent as the more severe types; but even in such cases the high range of temperature with the associated rapid disintegration of the red cells produces an adverse effect on the course of pregnancy, particularly in the early weeks.

The question whether the malarial parasite can pass through the placental barrier has been the subject of frequent discussion.

The observations of Wickramasuriya in the recent epidemic in Ceylon, reveal the fact the foetus can sometimes contract malaria *in utero* and that transplacental infection with the malarial parasites does occasionally occur. Transplacental foetal infection is perhaps more frequent with the severer forms of the disease, such as the malignant tertian. It may spontaneously interrupt pregnancy before term. In mild attacks, pregnancy may not be interfered with, but a severe attack, and more particularly repeated attacks, are liable to cause abortion, miscarriage or premature labour. Intra-uterine death of the foetus may also occur in malaria due to the high range of temperature. Another factor which has to be taken into consideration is the massive infection of the placenta with malarial parasites, which is to be seen in some cases of severe infection. A possible though rare cause of intra-uterine death is said to be the direct invasion of the foetus by the malarial parasites. There is also the possibility of some degree of toxæmia following malarial infection.

So far as the effect of malaria on labour is concerned, in many cases labour is not unduly prolonged and there is no special tendency for postpartum hæmorrhage. Parturition is likely to be difficult in cases exhausted by a prolonged attack of malaria or during the convalescent period. In such cases primary or secondary uterine inertia is not infrequent, associated with some degree of postpartum hæmorrhage and even shock. As a result, the maternal death-rate is necessarily high.

Infant mortality within the first week of life is increased by malaria. The exhausted condition of the mother, the anæmia and the malnutrition, affect the foetus *in utero* and the child is born with lowered resistance. In such cases, death from any inter-current disease is not infrequent.

The puerperium may also be complicated with puerperal sepsis. Colitis, enteritis and other complications are common. Even though the patient may have recovered from the malaria, if labour begins before she has entirely regained her health, the effect of malarial exhaustion is likely to be felt during the puerperium.

Another fact to be noted is that pregnancy by itself may cause a relapse in latent infections, either during the later weeks of pregnancy or during parturition or the puerperium.

So far as the prognosis in the different forms of malaria is concerned, the benign infection is less likely to interfere with pregnancy than the malignant. The malignant tertian types, on the other hand, are dangerous alike to the mother and child, and the prognosis should be guarded. The intensity of the paroxysms and the height of the fever, all other factors being equal, are points of bad prognostic significance.

Treatment.—*Prophylactic.* General measures for the improvement of the sanitation will no doubt be of great help in freeing any particular area from malarial infection. In the tropics, pregnant women should sleep under mosquito nets, and wherever possible live in mosquito-proof houses, when in an infected locality. After sunset, the application of the oil of citronella to the wrists and neck is useful.

Curative. Among the chief drugs which have been used in the treatment of this condition are quinine and certain of the synthetic products such as plasmoquin and atebirin. The patient should be confined to bed and the bowels moved by aperients. Quinine is still the most potent remedy we have. It is most effective in cases of benign tertian, less so in quartan and the malignant tertian. Of the many salts that are available the bihydrochloride of quinine is the most effective.

A mistaken impression is prevalent that quinine is contra-indicated in pregnancy. On the other hand, it may be definitely asserted that the danger to a pregnant woman lies in not administering adequate doses of quinine. The chief causes of interruption of pregnancy are the toxæmia of the malarial disease and the high range of temperature, and not the use of quinine. We have had several cases where it has been clinically proved that quinine, far from activating the gravid uterus, has, when given under suitable conditions and with due precautions, actually prevented the interruption of pregnancy.

There are wide variations in the dosage recommended by various experts. Quinine may be given by mouth either in solution or in cachets. In the benign forms quinine bihydrochloride, 5–10 grains, given daily for a week, and then continued on alternate days for a further fortnight, and for two days in the week for a further period of three months, has in our experience proved quite satisfactory.

It is rarely necessary to give the heroic doses that have been suggested. In certain cases the failure of quinine to act may be due to other causes. Unless the bowels are properly emptied and the associated anaemia is also simultaneously treated, quinine may not produce the same gratifying results. In some cases it is necessary to give quinine intramuscularly. The bihydrochloride is commonly used for this purpose—5 grains, dissolved in about 2 to 5 c.c. of distilled water and than sterilised may be given. Intravenous quinine injections are attended with great risk, particularly in the pregnant woman and in the puerperium, and we would definitely prohibit their use at these periods. In rare cases of cerebral malaria it may be necessary. In all cases where quinine is given, it is advisable to administer sedatives simultaneously, such as bromides in 15 to 20 grain doses.

Plasmoquin and Atebrin may be prescribed when Quinine is contra-indicated but plasmoquin is toxic and may cause formation of methaemoglobin. It should be given only under strict medical supervision.

Atebrin is less toxic but large doses may produce lesions of liver and kidneys which are already under physiologic strain during pregnancy. Consequently quinine is the drug of choice and its only contra-indication would be idiosyncrasy of the patient.

Plasmoquin has been proved to destroy the malignant tertian gametocytes but has practically no effect on schizonts. It is given in tablet form, combined with quinine, a $\frac{1}{4}$ grain of plasmoquin with 2 grains of quinine sulphate, two tablets being given three times a day after food for six days. This is repeated after an interval of four days, four or five courses being given. Toxic symptoms may sometimes appear such as headache, nausea, vomiting and bluish discoloration of the skin.

Atebrin is another of those synthetic products that have been used in recent years. It is given in doses of 2 to 3 grains daily over a period of four to five days. If a further course is necessary, an interval of ten days should be allowed as the drug tends to accumulate in the body. Its action is on the schizonts and it appears to be at least as effective as quinine, preventing relapses. Atebrin would appear to be contra-indicated in subjects of toxæmia of pregnancy, pre-existing nephritis and advanced hook-worm disease. Other synthetic products used are Mepacrine and Quinacrine.

In addition to these drugs, the general management of the patient requires some care. Suitable nourishing diet and tonics, particularly hæmatinics, should be given. The bowels should be kept fairly free and the patient should be kept under suitable hygienic surroundings and continuously watched till the termination of pregnancy.

Kala-azar

This is by no means an uncommon complication in pregnant women in endemic areas. The disease itself is due to a protozoon, the *Leishmania Donovanii*, present in the peripheral blood and the reticulo-endothelial system. It is most prevalent in Bengal, Assam, Madras and certain other cities of Southern India. It was a much-dreaded complication before modern methods of therapy were available. Abortion is not infrequent and the mother may collapse after delivery. The disease itself may be confused with malaria and the patient may be unfortunately drugged with quinine for long periods. A careful examination of the blood will reveal the leucopeniâ, the characteristic changes in the leucocytes and occasionally the presence of the *Leishmania Donovanii*, in the peripheral blood; the enlargement of the spleen and the slight enlargement of the liver are also points to be noted.

The cases may be mild, moderate or fulminant. Prognosis will naturally depend upon the nature of the onset, the extent to which the corpuscles are destroyed and on the presence of complications such as jaundice, grave anæmia, severe hiccough, anuria, hyperpyrexia, broncho-pneumonia and colitis.

The *diagnosis* can be confirmed by the serum antimony test of Chopra or by the formaldehyde test. The formaldehyde test is performed by adding one or two drops of commercial formalin to 1 c.c. of clear serum, which is immediately shaken and left at room temperature. When the reaction is positive, the serum immediately becomes viscid, and within one or two minutes assumes a whitish opalescent appearance and sets, so that the tube can be inverted without spilling. The therapeutic test would be equally effective both for diagnostic and curative purposes.

Treatment. Certain antimony compounds are specific and have robbed the disease of most of its terrors. The trivalent antimony compound, potassium and sodium antimony tartrate, is

given intravenously on an empty stomach in a 2 per cent. solution, beginning with an initial dose of $\frac{1}{2}$ grain in 1.5 c.c. of the solution, and increasing by $\frac{1}{2}$ grain (1.5 c.c.) up to a maximum of 2 grains (6 c.c.). Only freshly prepared solutions sterilised by boiling should be employed. The total quantity of the drug to be injected may vary from 40 to 60 grains. The pentavalent antimony compounds have, however, recently come into vogue. Stibamine, neostibosan and ureastibamine are some of the preparations frequently employed.

Simultaneously with the use of these injections, the condition of the blood should be improved by suitable hæmatinics. Large doses of iron in combination with arsenic are beneficial. Liver therapy may also be given; nourishing diet, plenty of fresh air and general hygienic measures should be employed.

It is rarely necessary to terminate pregnancy in this condition. If the case is taken in hand sufficiently early, pregnancy may continue up to full term and the child be born without difficulty. In untreated cases, on the other hand, a fatal outcome may result.

Blackwater Fever

This disease is fortunately rare in pregnant women. It is to be found only in some parts of tropical countries. It is restricted to the Agency tracts and the Jaipur Hills in Southern India. It is also present in parts of tropical Africa such as Uganda, East Africa, the Sudan, and in the Southern States of the United States of America.

It is an acute illness which occurs after an infection with the malignant tertian parasite and is characterised by severe hæmolysis, hæmoglobinuria, fever, vomiting, jaundice and anæmia. An acute condition such as this, has obviously a very deleterious effect on pregnancy. Interruption of pregnancy is not infrequent, and severe symptoms of toxæmia may be present. The onset is frequently sudden, associated with a chill and pain in the back. Nausea, bilious vomiting with jaundice and hæmoglobinuria occur in a short time.

Several different clinical varieties are met with such as the mild, the fulminant and the anuric. The prognosis depends upon the degree of hæmolysis, and as any severe degree of anæmia in pregnancy is associated with serious danger, pregnancy renders the prognosis graver.

Treatment consists in treating the anæmia and the associated heart failure, relieving the toxæmia and preventing suppression of

urine. Careful nursing is essential. The diet should consist of bland fluids like barley-water, fruit juice, glucose. Later, milk may be given or Benger's Food may be allowed. Proteins should be restricted for a considerable time on account of the involvement of the kidneys. Blood transfusion, intravenous glucose therapy and alkalisation of the urine should be done. The bowels should be kept fairly free by saline purgatives.

Quinine should, under no circumstances, be given in this condition. Atebrin or plasmoquin may have to be given for the associated malarial infection, if parasites are found persisting in the blood after two or three days from the onset.

Cholera

Cholera exists endemically in many of the Eastern countries and especially in India. At times, it occurs in an epidemic form. Not infrequently, therefore, the pregnant woman is affected. The disease itself is caused by the *Comma vibrio* and is characterised clinically by severe vomiting, copious rice-water stools, dehydration, cramps and suppression of urine. The specific micro-organisms are generally found in greatest numbers in the lumen of the small intestine and less so in the gall-bladder. In an acute condition such as this, it is obvious that pregnancy will be very adversely affected and that the prognosis for the pregnant woman will be much worse than for the non-gravid.

Three more or less well-defined stages may be noted in the course of the disease. The preliminary diarrhoea, when the patient has colicky abdominal pain, looseness of bowels, headache, vomiting and mental depression; later, the stage of collapse sets in; all faecal matter rapidly disappears; copious, colourless rice-water stools containing flakes of epithelium are passed. Watery vomiting may also occur. During this stage cramps starting in the hands, legs, and feet appear. Thirst, restlessness and collapse become extreme; the skin is cold, blue and wrinkled. The face is drawn and pinched, presenting the typical Hippocratic facies. The temperature may be subnormal, the blood pressure markedly low and the pulse almost imperceptible. The output of urine is diminished and it contains albumin and casts. Symptoms of uraemia may set in with suppression of urine. In the third stage, which is the period of reaction in favourable cases, there is recovery. The temperature rises to normal, the heart's action and blood pressure improve.

In this condition cardiac failure is not uncommon. Abortion and premature delivery are not infrequent. Even when the

pregnant woman has been fortunate enough to overcome the chances of interruption of pregnancy in the stage of collapse, abortion or miscarriage may occur in the period of reaction. The prognosis may therefore be said to be very grave, both because of the innate risks of such an acute condition and because of the added risks of pregnancy.

Treatment. There is no other acute infectious disease in which early treatment is so important.

Prophylactic. During an epidemic, cholera vaccine is valuable, affording temporary immunity. Particular care should be taken with all foodstuffs. Houses should be fly-proof and foodstuffs and drinks protected from flies. It is best to take hot foodstuffs and to boil everything that is to be taken as food or drink.

Curative. The essential treatment consists in replacing the fluids and salts lost from the blood by intravenous injections of hypertonic saline solution. The specific gravity of the blood should be noted and two solutions have to be used: (1) hypertonic saline for reinforcing the blood volume and chloride loss, and (2) an alkaline solution to counteract acidosis and uræmia.

The hypertonic solution consists of—

Sodium chloride	. . . . .	120 grains
Potassium chloride	. . . . .	6 "
Calcium chloride	. . . . .	6 "
Water	. . . . .	1 pint

The alkaline solution consists of—

Sodium bicarbonate	. . . . .	160 grains
Sodium chloride	. . . . .	90 "
Water	. . . . .	1 pint

The salts are sold in the shape of tablets and can be readily obtained for this purpose.

During the stage of collapse, one pint of the alkaline solution is given, supplemented with the hypertonic solution to the extent indicated by the specific gravity of the blood. If the specific gravity is above 1060, the amount of hypertonic solution will depend upon the excess over this figure of the specific gravity. That is, if the specific gravity is 1062 or 1063, 2 or 3 pints of the hypertonic solution will have to be given. Care must be taken to watch for the rise in temperature after the hypertonic saline, and any tendency for hyperpyrexia should be combated.

Threatening uræmia is treated by poultices to the loins, dry cupping, alkaline solution per rectum and by injections of 5 to 10 per cent. glucose. Drug therapy by mouth is almost entirely limited to the use of potassium permanganate and kaolin; potassium

permanganate can be given in 2-grain pills or in solution, and kaolin, 1 to 3 drachms in water, may be given every half hour. Hypodermic injections of atropine sulphate, 1/100 grain, morning and evening, are also useful.

The diet in this disease is to be given with great caution and should be entirely liquid. Till reaction has set in, no nourishment is necessary. When tolerated, glucose, barley-water and rice-water may be given; and as the patient improves, farinaceous food is allowed; but proteins and extractives must be withheld until the kidneys have begun to function normally.

It is inadvisable to terminate pregnancy in this condition. When, however, abortion or miscarriage is inevitable, help along conservative lines without the administration of an anæsthetic may be needed.

Filariasis

This disease may sometimes affect the pregnant woman. As it is prevalent in many parts of India, it is not infrequent to see some of the manifestations of filarial infection in association with pregnancy. The commonest is *elephantoid growth* of the vulva, which may be extensive enough to produce mechanical obstruction to the passage of the foetus during labour. Another effect of filariasis is *chyluria* in pregnancy. The occurrence of filarial fever itself may occasionally interfere with pregnancy.

In cases where elephantiasis of the vulva is present, the mode of delivery should be decided beforehand. In most cases where the growth is at all considerable, the safest course is to resort to delivery by the abdominal route. It is not desirable forcibly to deliver the foetus through the vagina in the presence of elephantiasis of the labia, as invariably extensive lacerations occur which cannot be sutured and later may slough. The dangers of puerperal infection are thus considerably increased. Occasionally in the presence of elephantoid growths of the vulva, prolonged labour occurs resulting in rupture of the uterus if the patient is not under medical care. In such cases it would appear desirable to perform a Cæsarean hysterectomy.

Removal of the growth during pregnancy is not desirable, as the bleeding is severe and interruption of pregnancy may occur. If the parts slough, as they often do after removal, the chances of puerperal infection are great, should the woman abort or have a premature delivery.

Chyluria is sometimes a troublesome complication in pregnancy. The condition may occasionally necessitate interruption of

pregnancy. The treatment of this condition leaves much to be desired.

In cases of elephantiasis of the vulva the patient should be advised to have the growth removed at a suitable time after delivery.

Beri-beri

This is a deficiency disease due to lack of vitamin B₁, and occurs frequently in tropical countries where rice is the staple article of dietary among the population. It is fairly widespread in parts of India, Japan, Malaya, East Indies and the Philippine Islands. The disease may occur in pregnant women and in women in the puerperium or the lactating period.

Its importance in pregnant women is due to the fact that, if certain types of the disease occur, such as those with the cardiac manifestations prominent or the wet type of beri-beri, the prognosis is much graver.

The correct diagnosis of this condition is necessary for proper line of treatment to be adopted. In the wet form of beri-beri, the disease should not be confused with conditions during pregnancy which produce varying grades of oedema or with the toxæmias of pregnancy. The paræsthesia and heaviness of the limbs, the absence of the knee-jerks, the tenderness of the calf muscles and the general weakness of the patient, together with shortness of breath, dyspnoea and tachycardia suggest Beri-beri. The heart may be found dilated, particularly the right side, with systolic murmurs and embryocardia. Examination of the urine, however, reveals that it is free from albumin and casts. In the acute cardiac type, the cardiac symptoms may predominate from the onset, and signs of decompensation may appear with pre-cardial pain, epigastric distress, tachycardia, evidence of congestion of the lungs and tenderness over the liver with subcutaneous oedema and serous effusions. At any stage in the course of the disease, interruption of pregnancy may occur. The disease is very fatal and death occurs within a few hours or a few days.

The treatment consists in prophylactic measures being adopted in cases of pregnant women in the particular endemic area. A balanced diet may be provided with adequate vitamins, particularly B₁. This can be given in the shape of foods rich in B₁, such as eggs, milk, liver, yeast, etc. In institutions where polished rice or white bread is the main article of dietary, under-milled or hand-pounded rice, and whole-wheat flour should be substituted and tinned provisions avoided.

When the disease manifests itself during pregnancy should be put to bed and complete rest ordered. of the heart should be carefully noted, and if decompensation manifest themselves, cardiac stimulation. At first only small feeds should be given Marmite, and later a dry low carbohydrate diet should be allowed. Thiamine Hydrochloride (Vitamin B₁) be given in severe cases in doses of 1 to 3 milligram by the mouth; for heart failure, intramuscular in 50 milligrammes have been given with dramatic results in some cases.

Infantile Beri-beri

This disease is responsible for a heavy incidence of mortality. In the case of infants, whose mothers are latent or clinical beri-beri, the disease may occur in the acute and chronic form. In the chronic form, gastro-intestinal symptoms are present such as anorexia, vomiting, diarrhoea associated with wasting, slight fever, pallor, oedema. Later, other evidences of cardiac insufficiency manifest themselves. In the acute form, death may occur with rapidity, the infant suffering from severe pain and the symptoms of cyanosis and dyspnoea. In all cases of suspicion of latent or clinical beri-beri in the mother, the feeding should be withheld, the child should be put to a healthy wet nurse, if available, should be put to this purpose. Extracts of rice polishings have been found to be wonderfully efficacious in this condition.

Leprosy

The scourge of leprosy is so widely prevalent in some countries that cases occur where pregnancy is common. This is a disease produced by a specific bacillus characterised by lesions of the skin, nerves and viscera, resulting in anaesthetic patches, ulceration and atrophic lesions.

It is unnecessary to go into details with regard to this condition. Its importance with regard to pregnancy is the fact that when a leprotic woman becomes pregnant, it occasionally be an exacerbation of the condition and the foetus has also to be taken note of. It is important in such cases to adopt adequate prophylactic measures, in order to prevent the disease from being transmitted to the child.

desirable, in tropical countries. The lack of proper organisation, the financial difficulties and the inadequacy of accommodation and proper facilities for the care of lepers make the problem so complicated and difficult that at present, it may be said that in every large city and even in the rural areas there is promiscuous mixing of lepers with the healthy population. The pregnant woman should be isolated and carefully looked after. Besides the usual treatment that is adopted for the leprotic condition, care should be taken to see that proper diet and hygienic surroundings are available. Our own experience of pregnancy in leprotic women is that the foetus generally goes on to term and is born in a healthy condition. It is rarely that interference has been necessitated, and where such interference was required it was to help the woman with forceps or extraction.

During the puerperium, there is a risk of puerperal sepsis. Particularly in the nodular and ulcerating types of leprosy, genitalia should be protected from possible infection by contact with soiled linen of the patient.

A question of importance is the care of the child after delivery. The child should at once be removed from the diseased parent and must be carefully looked after, preferably in an isolated room. If so treated, the child may escape leprotic infection. It is a moot question whether leprosy can be directly transmitted to the foetus *in utero*; but the possibility of the infection is very great because of the intimate association between the mother and child if the child is left to the care of the mother.

A problem that arises in this condition is whether a leper should be allowed to marry. Obviously, no leper should be allowed to marry a person who is of sound health. Should a leper be allowed to marry another leper? In the present state of our knowledge, from the hygienic and eugenic points of view, it would appear to be a risky experiment to allow offspring from leprotic parents. As, however, this question may be decided without any reference to medical opinion, the only alternative is to warn the parents about the possibility of infecting the child after delivery and to suggest to them that the child should be segregated and specially cared for.

Helminthiasis

HOOKWORM DISEASE

Hookworm disease, or ankylostomiasis, is very common in tropical and subtropical countries and is one of the most common causes of chronic invalidism, of mental and physical weakness and

not infrequently of death. Its greatest danger appears to be when it occurs as a complication of pregnancy. The disease is due to the worms attaching themselves firmly to the mucosa of the duodenum and the small intestine, feeding on blood and causing local bleeding. Toxins are also probably produced by the parasites which depress the erythroblastic activity of the bone marrow. There are two common forms of the hookworm—the *Ankylostoma duodenale* and the *Necator americanus*. The two species differ in so far as their buccal armature is concerned. The capsule is smaller in *Necator americanus* and has an irregular border instead of the four ventral hook-like teeth of the *Ankylostoma duodenale*. There is also a pair of semilunar plates in the *Necator*.

When the infection has taken place, and particularly if it is heavy, symptoms may appear within one or two months. These are largely related to the anæmia, which is of the secondary type, associated with a low colour index and an increased blood volume. The red cells may have diminished to one to two and a half millions and the hæmoglobin may vary from 10 to 25 per cent. Mild cases may be symptomless; but in the moderately severe cases mental and physical lethargy, hyperacidity, epigastric tenderness, palpitation and shortness of breath are present. In the more severe type there may be a discoloration of the skin, which is dry and muddy in colour. Pallor of the mucous membranes is particularly marked. The pale, flabby tongue, combined with the general puffy appearance of the face and its muddy complexion, give a striking picture of this condition. The veins of the neck may be pulsating and hæmic murmurs are common. Retinal hæmorrhages, cedema of the feet and serous effusions may also occur.

Diagnosis. The disease can be easily diagnosed by the characteristic clinical picture and confirmed by the examination of the stools, which will show the typical ova, especially if the floatation method is adopted.

Influence of Hookworm Disease on Pregnancy, Labour and Puerperium. This disease has a very adverse effect upon pregnancy. Spontaneous interruption of pregnancy is not infrequent, abortion, miscarriage, premature birth and still-births being common occurrences, especially in the neglected or untreated cases. Associated with this condition there is marked albuminuria and anasarca, particularly in the last trimester of pregnancy. These are secondary and not symptoms of essential toxæmia.

During the puerperium, owing to the low vitality of the patient, the incidence of puerperal sepsis is greater. Diarrhœa, dysentery, pyelitis, etc., are not uncommon complications.

Prognosis. In general, the prognosis is unfavourable both to the mother and the child when hookworm disease complicates pregnancy. This is due to the anæmia and the tendency for cardiac failure. In the severe types of anæmia, the same adverse effects may follow labour as in pernicious anæmia of pregnancy. The period immediately after labour is the most serious. Sudden death after delivery is not infrequent. The longer the patient has been under treatment and the greater the improvement in her general condition, the better are the chances of her survival.

If the patient survives the shock of labour, she has to be particularly watched during the puerperium. The risks of cardiac failure, respiratory embarrassment and puerperal sepsis are by no means small.

The prognosis for the child is also unfavourable. The tendency for premature delivery and the greater incidence of convulsions make the prognosis more unfavourable for the child.

Treatment. From what has been stated above, it will be realised that hookworm infection is a serious complication in pregnancy. In all areas where ankylostomiasis is prevalent, care should be taken to examine all pregnant women in the early months of pregnancy and to adopt the anti-hookworm treatment if necessary. The need for mass treatment in cases of hookworm infection in communities need hardly be emphasised. A routine hæmatological examination at the antenatal clinic of all pregnant women at any stage of pregnancy has already been referred to.

When the anæmia has been definitely diagnosed as due to hookworm, the treatment should be started at once. Pregnancy is no contra-indication; on the other hand, it is a positive indication for early and speedy treatment. The fear that abortion or miscarriage will follow as a result of the treatment is absolutely groundless, although it must be realised that care is necessary to avoid too drastic methods.

One of the essential precautions in the management of the condition is carefully to examine the heart and the circulatory system and to treat the anæmia.

The proper method of treatment for this condition is the use of anthelmintics of repute. The best among these are oleum chenopodium, carbon tetrachloride, beta-naphthol and thymol. The combination of carbon tetrachloride with oil of chenopodium is very effective. In some cases, the administration of calcium and glucose may form an integral part of the preliminary preparation. Glucose should be given in drachm doses in water several times a day for a number of days before and after treatment. Calcium

may be administered orally in the form of calcium lactate or colossal calcium; but when there is difficulty in absorption owing to the condition of the gastro-intestinal tract, calcium gluconate, 10 c.c. of a 10 per cent. solution, or colossal calcium, 1 c.c. may be given intramuscularly. For the anæmia, large doses of iron and liver therapy are indicated. Injections of P.A.F. Hepatax and Iron and Arsenic preparations may be given intramuscularly especially in those who cannot tolerate them by mouth.

After this preliminary treatment and when the hæmoglobin index is raised to 40%, the anthelmintic is administered on an empty stomach, first thing in the morning. It is important to realise that the dosage of the anthelmintic as well as the essential purgative should be much less in the case of a pregnant woman than in the case of the ordinary adult. It is not desirable to give the large purgative advocated for such cases owing to the possibility of inducing labour. On the other hand, a certain amount of purgation is very necessary, so that the ova and the worms may be cleared out of the intestines. The maximum dose of carbon tetrachloride or tetrachlor ethylene must not exceed 30 minims, while oleum chenopodium should be given in doses not exceeding 10 minims. It is well to give any of these drugs, using a saturated solution of magnesium sulphate as the vehicle. A commonly prescribed draught is as follows:—

Oleum chenopodium	• • • • •	10 minims
Carbon tetrachloride	• • • • •	20 "
Saturated solution of magnesium sulphate	•	1 to 1½ oz.

In some cases, thymol may be administered in doses of 10 grains at intervals of one or two hours, say at 6, 8 and 10 A.M., not more than three doses being administered, followed by magnesium sulphate, an ounce at noon. Occasionally it is desirable to alternate the anthelmintics, which may be given at intervals of a week or ten days; thymol treatment being followed by that with oleum chenopodium, or the combination of oleum chenopodium and carbon tetrachloride.

The use of the anthelmintics may be attended with symptoms of poisoning in some cases. Thymol solvents, including alcohol, fats such as butter and milk, castor-oil, ether, glycerine and chloroform should be avoided for at least forty-eight hours, as they may lead to excessive absorption of the drug.

Carbon tetrachloride may cause symptoms of poisoning in twenty-four to forty-eight hours, such as pain in the abdomen, vomiting of bile-coloured fluid, headache, rise in temperature and tenderness in the hepatic and epigastric regions, with enlargement

of the liver, jaundice and sometimes convulsions. Should these symptoms appear, intensive treatment with calcium and glucose should be instituted. The bowels must be promptly moved. This anthelmintic should not be used when there is fever or hepatic, renal, pulmonary or heart disease or calcium deficiency.

With chenopodium, symptoms of poisoning may appear in two or three hours or may be delayed for as long as thirty-six hours. The early symptoms are headache, dizziness, deafness, tingling of the fingers and sometimes drowsiness. In fatal cases convulsions and coma may precede death. When warning symptoms of poisoning develop it is essential that immediate evacuation of the bowels should be obtained by copious and repeated enemata, and if possible by repetition of the purgative by mouth.

When any of these anthelmintics are used, the stools should be examined and the number of worms counted. Seven to ten days later the stools should be examined again, and if ova have reappeared then another course, preferably with a different anthelmintic, is advisable.

When carbon tetrachloride or chenopodium or tetrachlor ethylene is used it is not desirable to repeat the treatment within a fortnight, as time should be given for the recovery of any hepatic damage which may have resulted from the previous treatment.

With the elimination of the hookworms and their ova, considerable improvement occurs in the general health of the patient and the hæmoglobin percentage can be seen to rise rapidly.

To effect prompt improvement, it is necessary that the anæmia should be actively treated. For this purpose iron is necessary. Ferri-et-ammonium citras, pilula ferri, or ferrous carbonate are preparations commonly used. Liver therapy is beneficial. Vitamin therapy is also of great value. Marmite, adexolin, preparations of cod-liver oil are all helpful at this stage. The diet should be light and nutritious, and if there is albumin in the urine it is perhaps desirable to restrict the patient to a salt-free diet.

Management of Labour and Puerperium. The general principles guiding the management of labour in cases of pernicious anæmia of pregnancy hold good in all severe types of ankylostomiasis. It is most undesirable to induce labour in an anæmic woman. The first step to be taken is to improve the condition of anæmia and get rid of the factors responsible for it. When the woman is in labour, the second stage should be expedited to save the strain upon the already damaged heart.

After labour it may be necessary to give cardiac stimulants, inhalations of oxygen, glucose by mouth or intravenously.

The puerperium should be carefully managed to avoid any danger of sepsis or intercurrent disease such as diarrhoea, dysentery, etc. After the puerperium the patient should again be examined to ascertain her exact condition and the possibility of hookworm infection still lurking. Periodic examination of the patient's stools should be advised and prompt treatment adopted whenever necessary.

CHAPTER XX

DISEASES OF THE BLOOD

Anæmias

THE hæmopoietic system plays a dominant rôle in the causation of certain complications during pregnancy. Although the hæmopoietic apparatus of the fœtus is distinct from that of the mother, the necessary oxygen and nutrition for both have to be supplied through the maternal system. An unusual burden is therefore placed upon the blood-forming mechanism of the mother during pregnancy. In some cases the maternal system does not respond to this heavy strain. The fœtus has to be supplied with oxygen and nutrition to its growing needs and this is obtained at the

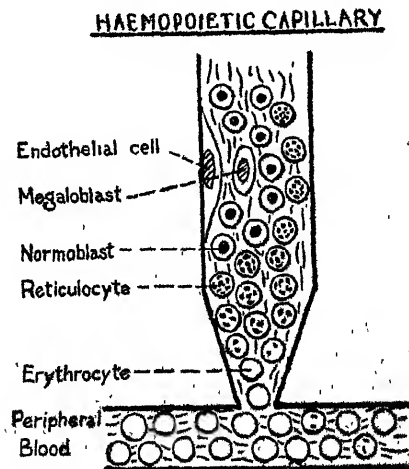


Fig. 58.—The maturation of the red blood cells.

expense of the mother irrespective of her requirements. If, added to the normal increased strain on the hæmopoietic system, there should be other conditions likely to interfere with the physiological reaction of the system by causing either a diminished production or an increased loss of some or other of the contents of the blood,

it is obvious that a severe degree of anaemia must necessarily result. This complication is more likely to occur in the tropics, owing to the large number of tropical diseases which have an adverse effect upon the blood and also owing to the greater prevalence of nutritional deficiency.

In a healthy pregnant woman the total quantity of blood is increased, especially in the later months, and the blood-forming organs ordinarily show marked activity. The spleen enlarges, the bone-marrow is active and the lymph glands all over the body are frequently enlarged. In cases, however, where the pregnant woman suffers from certain diseases, or is the subject of nutritional defects, anaemia develops easily. It is quite common in the tropics to see a large number of women, particularly during the last trimester of pregnancy, showing some degree of anaemia. This condition is so prevalent that it should be a rule in all antenatal clinics to make a thorough hæmatological examination in every case.

METHODS OF HÆMATOLOGICAL EXAMINATION

For a clear conception of the degree of anaemia and the particular variety of anaemia from which the pregnant woman is suffering, the following procedure should be carried out.

After a systematic examination of the case, the following investigations should be made :—

(1) Hæmoglobin estimation. This can be done by any of the well-known hæmoglobinometers, one of the common instruments giving a reasonably accurate reading being the new model improved Dare's hæmoglobinometer.

(2) White cell count. An estimation of the white blood corpuscles together with a differential count should always be made.

(3) Red cell count. The total number of red cells per cubic millimeter should also be taken.

(4) Reticulocyte count. Reticulated R.B.C.s are young R.B.C.s in which can be demonstrated a fine reticulum by means of a special stain. Their importance is due to two factors: they are of the greatest value in the diagnosis of the severer forms of anaemia, and from the standpoint of treatment one may often judge of the efficacy of a certain type of treatment by the reticulocyte response. In pernicious anaemia, for instance, three to seven days after treatment with liver therapy there is a sharp increase in the reticulocytes.

To demonstrate the reticulocytes the blood film is stained with a saturated alcoholic solution of brilliant cresyl blue, and after drying, counterstained with Leishman's stain. The reticulocytes are easily made out and their proportion can be noted by noting their number in a count of a thousand R.B.C.s.

(5) Measurement of the mean diameter of the red cells. This is done by one of two methods: the Price-Jones' method or the diffraction method.

In the Price-Jones' method the size of the red cells is noted and an average taken and plotted on a graph. A shift of the peak to the right is characteristic of all macrocytic anæmias; but the combination of this factor together with a marked broadening of the base of the curve is seen at its greatest in primary pernicious anæmia. On the other hand, in most secondary anæmias and in simple achlorhydric anæmia the peak is shifted to the left.

(6) Examination of the stained blood film. This is very essential not merely to get a general picture of the blood but also to note the presence of any abnormalities, such as parasites of malaria, kala-azar, etc.

(7) Van den Bergh's test. This test enables us to distinguish hæmolytic from obstructive jaundice, and by the icteric index to

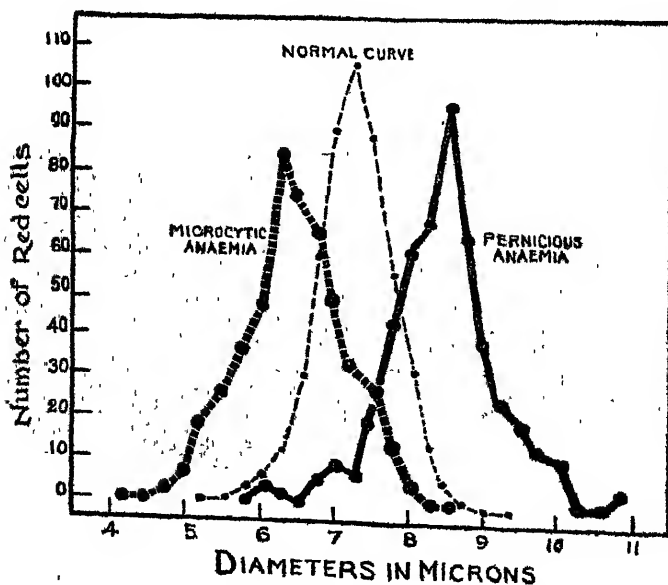


FIG. 59.—Price-Jones' curve in cases of anæmia.

assess the condition quantitatively. The reaction, when positive, may be either direct or indirect or biphasic.

(8) Test meal. In the severe types of anæmia, it is always desirable to examine the gastric contents after a test meal. This gives an indication, among other things, as to whether the anæmia is associated with either an absence or diminution of free hydrochloric acid in the gastric juice.

(9) Examination of the urine. This is done as a matter of routine and should furnish information as to the presence of bile, urobilin, blood, albumin and casts in the urine.

(10) Examination of the fæces. It is very necessary to examine this for the presence of occult blood and any ova or parasites. The frequency with which severe forms of anæmia are associated with intestinal parasites, particularly in the tropics, should be borne in mind. The presence of hookworm infection or a heavy infection with round worms or the different varieties of tapeworms makes the examination of the fæces a necessary routine.

Among the other tests which may be done are a blood platelet estimation, the fragility test, the Arneeth count and the blood sedimentation test.

The fragility test is the estimation of the resistance of the erythrocytes to varying strengths of sodium chloride solution. This is of great importance in jaundice as it will help to differentiate the hæmolytic type of jaundice from the non-hæmolytic.

The blood sedimentation test depends upon non-specific reactions occurring as the result of tissue destruction, change, or inflammation in the body.

While it may not be necessary to go through all the different tests enumerated above in every case, the estimation of the corpuscular content and hæmoglobin would enable one, in the first instance, to decide whether the patient is definitely anæmic or otherwise; and where a case has been diagnosed as one of anæmia it is necessary to go through the majority of these routine tests.

ANÆMIA AND PREGNANCY

A classification which has been in vogue for some time, but which is gradually losing its significance, is to divide the anæmias into primary and secondary. We now realise that even the so-called primary anæmia is due to causes which are as yet not clear while the secondary anæmias are due to factors which are definitely known.

A method of classification is to divide the anæmias according to the colour index. Thus, the anæmia is said to be hyperchromic if the colour index is high, orthochromic if the colour index is normal and hypochromic if it is low.

Another classification is according to the size of the red cells. An anæmia is said to be macrocytic if a large number of megalocytes are present, that is, anæmia characterised by an increase in the size of the red blood corpuscles. It is normocytic if the red cells are normal in size and microcytic if the majority of the red cells are diminished in size.

Combining the two, we may therefore have—

A macrocytic hyperchromic, orthochromic or hypochromic anæmia, and

A microcytic hyperchromic, orthochromic or hypochromic anæmia.

Usually, however, the two common types met with are:—

- (1) Macrocytic hyperchromic anæmia, and
- (2) Microcytic hypochromic anæmia.

The *secondary anæmias* are generally microcytic and hypochromic, although in some of the very severe types, such as that due to the *Dibothriocephalus latus*, or the pernicious anæmia of pregnancy, one may have a hyperchromic form of anæmia associated with megalocytes or microcytes.

Primary macrocytic hyperchromic anæmia, or *pernicious anæmia*, or *Addisonian anæmia*, is characterised by a megalocytic anæmia, achylia and a tendency to degeneration of the spinal cord. It pursues a remittent course, which is invariably fatal unless appropriately treated. Fortunately this disease is very rare in pregnant women; but it has a close resemblance to the pernicious anæmia of pregnancy dealt with below.

It is not possible to give an exhaustive classification of the different types of anæmia, nor is it necessary for our purpose. The common forms of anæmia met with in pregnant woman may be classified under the following heads:—

(1) Physiological anæmia of pregnancy.

(2) Nutritional deficiency anæmias—

(a) Primary macrocytic hyperchromic anæmia, that is, pernicious or Addisonian anæmia complicating Pregnancy.

(b) Secondary macrocytic hyperchromic anæmia, sometimes spoken of as Pernicious anæmia of Pregnancy.

(c) Secondary microcytic hypochromic anæmia.

(3) *Hæmolytic anæmia*: a form of secondary anæmia which may occur from several causes, such as malaria, kala-azar, septic infections, poisons such as arsenic, lead, or phosphorus, and intestinal parasites, particularly ankylostomiasis.

- (4) Post-hæmorrhagic anæmia, which may be either acute or chronic, resulting from the loss of blood from the gastro-intestinal, urogenital or respiratory tracts.
- (5) Other forms of anæmia, such as aplastic types, may also occur in pregnancy.

PERNICIOUS ANÆMIA OF PREGNANCY

This condition is very common, particularly in tropical and subtropical countries, and it is now recognised that it is a form of tropical nutritional anæmia. In the more severe forms of this disease, the characteristic features are a destruction of the red cells, a high colour index and a megalocytic blood picture. It may recur in successive pregnancies and is attended with grave risks to the life of the individual, particularly at the time of labour. Before modern methods of treatment were available, the disease was responsible for a heavy mortality among pregnant women;

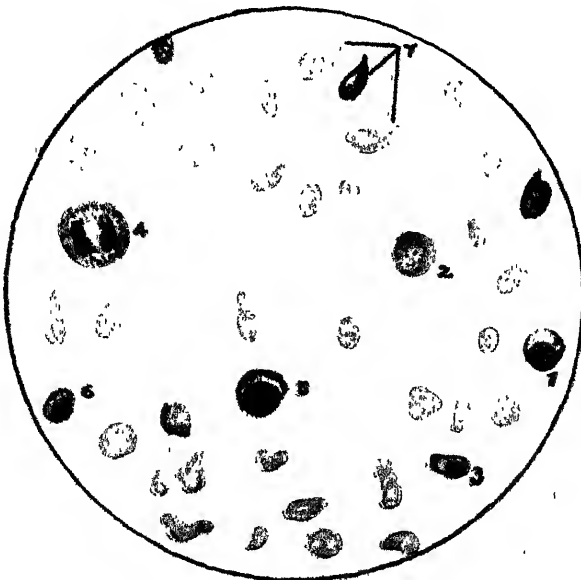


Fig. 60.—Blood picture in a severe case of pernicious anæmia.

- | | |
|--|-----------------------|
| 1, 5—Megaloblasts. | 3, 6—Normoblasts. |
| 2—Punctate cell (granular degeneration). | 4—Leucocyte (normal). |
| | 7—Poikilocytes. |

40 to 50 per cent. of the cases invariably ended fatally. The disease appears to be more frequent in multiparæ than in primiparæ and has a very insidious onset. The patient hardly realises the gravity of the condition till there is generalised œdema, attacks of dyspnœa and extreme weakness. An examination of the blood

shows marked reduction in the red cells and great alteration in the shape, variations in size and the presence of nucleated red cells. The colour index may be high.

This type of anæmia differs from the Addisonian type in some respects. The free hydrochloric acid content of the gastric juice may be perfectly normal, or may be slightly diminished, but achlorhydria or achylia gastrica is not present; secondly, there is no tendency to subacute combined degeneration of the spinal cord. Thirdly, while the indirect Van den Bergh test is positive in both, from the point of view of quantitative estimation it is much less in "pernicious anæmia of pregnancy" (0.5 to 1.5 units) than in the Addisonian type (0.75 to 5 units).

Physical Signs and Symptoms. The disease makes itself evident between the twentieth and twenty-eighth weeks of pregnancy. The patient has a lemon yellow colour suggestive of Addisonian anæmia. She may complain of extreme weakness, breathlessness on slight exertion and occasional attacks of palpitation. The appetite is poor and the urine may be passed in small quantities. Occasional attacks of giddiness and fainting may occur. The face is puffy and there is œdema of the feet, with varying quantities of albumin in the urine. The tongue is sore in some cases. The heart is enlarged slightly and hæmic murmurs are present; the heart sounds are not rapid except in the late stages. The blood pressure is normal but may sometimes be subnormal. Râles may be heard over the lungs and there may be effusion into the serous cavities in the severer form of anæmia. Hæmorrhages into the retina may be seen in some of the cases. The liver and spleen are not notably enlarged.

The disease takes a progressive course until death supervenes, or in some cases spontaneous improvement occurs in the puerperium. Labour generally sets in prematurely and is precipitate. During labour there is often a blood crisis, characterised by an increase in the number of megalocytes, normoblasts, myelocytes and reticulocytes in the blood, associated with cyanosis, dyspnoea and rapidity of the pulse-rate. The patient's condition becomes much worse immediately after parturition. In fact, this period seems to be the most critical, as with the birth of the child the breathing becomes more laboured, hyperpnoea and dyspnoea develop, the patient becomes comatose, and although the heart may continue to beat, the respirations become more shallow and sighing, till the patient expires.

If the patient survives the shock of labour the prognosis is slightly better, but the first few days of the puerperium are still

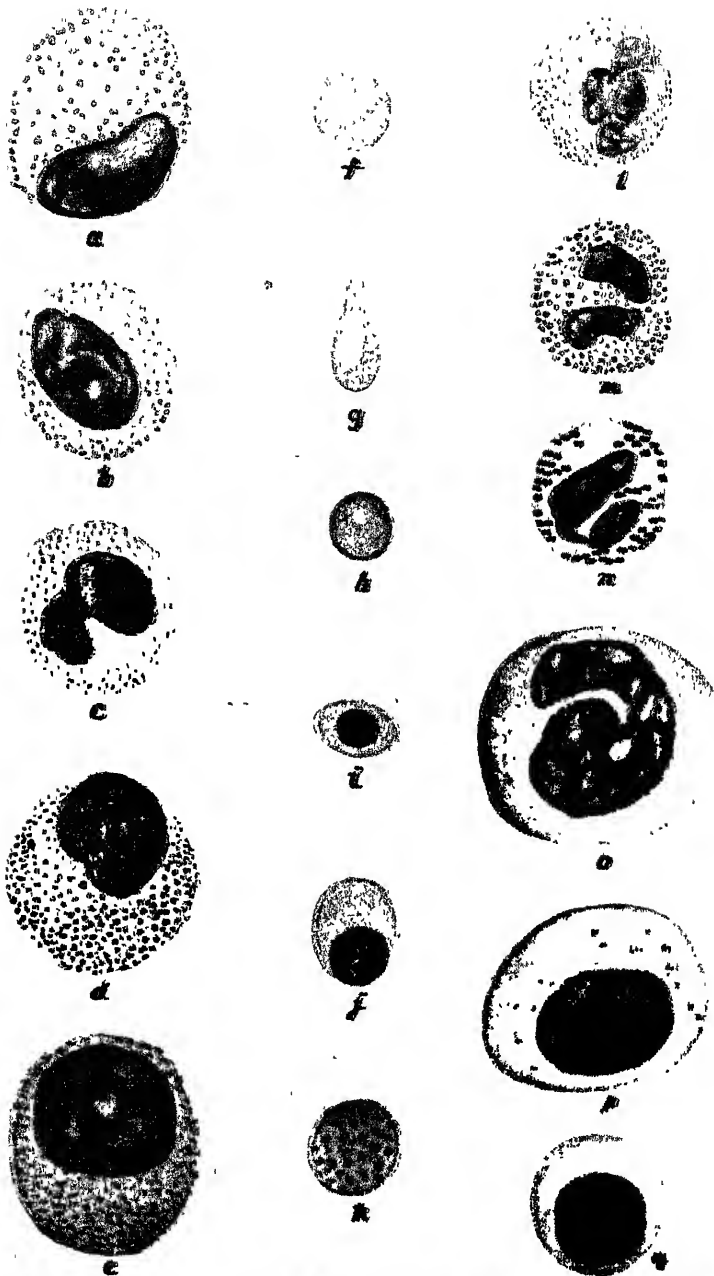
critical and the slightest indiscretion on the part of the patient leads to a repetition of the symptoms just described.

Prognosis. From what has been stated above, it is obvious that the prognosis is grave for both the mother and child unless energetic treatment be adopted.

When the patient seeks advice late in pregnancy, and particularly if labour supervenes before effective treatment has been adopted for some time, the prognosis is grave. If, however, the patient appears at an earlier stage and treatment has been continued for some time, the prognosis improves.

Treatment. Whatever the method of treatment adopted, it must be such as to produce a ready response and a rapid improvement in the condition. Liver therapy is the most efficient. There are several preparations, some of which can be given by mouth and some by intravenous or intramuscular injections. In the severer types of cases, it would appear that it is best to start with intramuscular injections of liver extract, or even with intravenous injections. Occasionally the patient's condition may be such that an intravenous injection is not without danger. We prefer in such cases intramuscular injections of liver extract, of which there are a number of preparations of high repute on the market. Together with intravenous or intramuscular injections of liver extract, it is desirable to give, by mouth, preparations either of liver extract or hog's stomach or autolysed yeast. A preparation that has been found useful in these cases is Marmite, which contains vitamin B. But it must be realised that Marmite alone does not show a sufficiently rapid or progressive rate of improvement and it will be well therefore to combine it with liver therapy either by the oral administration of liver extracts or by intravenous or intramuscular injections.

To note the response, a reticulocyte count should be made before the treatment is started, and repeated every second day to note the reticulocyte response. It is also desirable to note the hæmoglobin content and the red cell count. If these three counts are charted a very accurate idea of the response to the different methods of treatment can be obtained. The necessity for a chart will be more obvious when it is stated that in some cases various additional measures of treatment have to be adopted to procure a favourable and progressive response. Liver therapy may not be sufficient in quantity, or it may not be sufficient by itself and may have to be combined with other methods of treatment. When liver is given by mouth it is necessary to realise that a sufficient quantity should be administered. If whole liver, raw or lightly cooked, be given, approximately half a pound a day should



Cells in bone-marrow. Normal and abnormal red cells. Normal leucocytes.

FIG. 61.—Blood cells, normal and abnormal.

- | | | |
|-----------------------------------|---------------------------|-----------------------------|
| (a) Neutrophil myelocyte (large). | (f) Normal red cell. | (l) Polynuclear neutrophil. |
| (b) Neutrophil myelocyte (small). | (g) Poikilocyte. | (m) Eosinophil. |
| (c) Transitional neutrophil. | (h) Polychromatophilia. | (n) Mast cell. |
| (d) Eosinophil myelocyte. | (i) Normoblast. | (o) Large hyaline. |
| (e) Basophil myelocyte. | (j) Megablast. | (p) Large lymphocyte. |
| | (k) Granular degeneration | (q) Small lymphocyte. |

be administered throughout the whole course of treatment from the stage of severe relapse to complete remission. In practice, however, gastric digestion is so impaired in the relapse stage as to make the ingestion of adequate quantities difficult, and in consequence, liver extract or ventriculin is usually employed. As soon as possible, however, whole liver should be substituted, as it is a great deal cheaper than liver extract and contains rich stores of vitamin, organic iron and amino-acids of high nutritional value. The use of the whole gland eliminates the danger of using extracts which are comparatively inert or impotent.

In administering liver extract one may give a single large dose or a moderate dose repeated over a fairly long interval. Excessive quantities, however, are badly tolerated, especially in the severe types and should generally be avoided.

Besides liver therapy, the other accessory methods of treatment to be adopted are:—

Vitamin Therapy. It has been suggested that vitamin B₂ complex is one of the essential factors deficient in this condition,

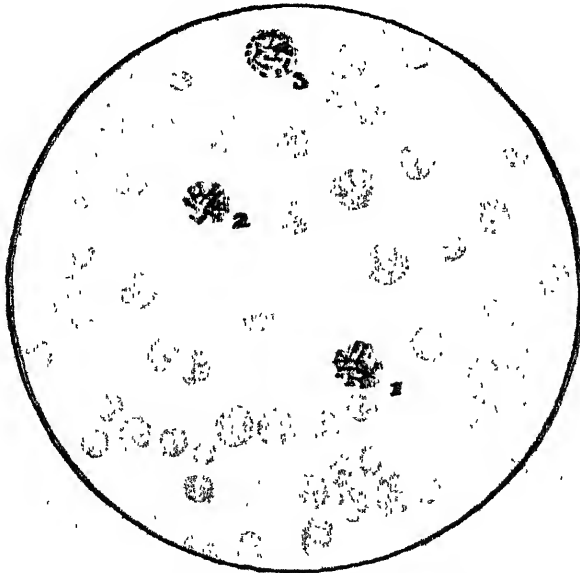


FIG. 62.—Reticulocyte response in the treatment of anæmias.

1, 2, 3—Reticulocytes.

and for this reason Marmite is given. In association with liver therapy Marmite is useful.

Preparations of vit. B are of great value and may be given intramuscularly and when the condition has improved the injections can be replaced by oral therapy.

Iron. Although many cases improve remarkably with liver therapy and with preparations of hog's stomach, such as ventriculin, the improvement is not as satisfactory, or after a certain stage the patient does not show further progress. In such cases the administration of iron is very useful. It should, however, be realised that iron should be given in large doses—60 to 90 grains of the scale preparations, such as iron and ammonium citrate, being given daily.

Combination of iron with liver therapy has given excellent results in our hands and we recommend in severe cases of anæmia 4 to 6 intramuscular injections of P.A.F. Hepatax 5 c.c. or Anahæmin 2 c.c. on alternate days with iron therapy in the doses suggested above.

Hydrochloric Acid. In view of the presence of hypochlorhydria in a good proportion of cases, it is desirable to administer $\frac{1}{2}$ to 1 drachm of the dilute acid in orange juice or water at the end of each meal.

Blood Transfusion. This is a valuable method of therapy in certain cases of anæmia; but it is doubtful if the severer types of pernicious anæmia are suitable for blood transfusion. Particularly in those cases where the blood count shows less than one million red cells, it is far from being the safe and simple procedure which it is suggested to be. The reaction that may set in, the rigors, the high temperature, the marked tachycardia, and in some cases signs of renal damage such as albumin and casts in the urine, no matter how carefully the blood is matched or how slowly it is injected, all add to the risks. Moreover, the degenerated myocardium is unable to stand the additional strain of the reaction. While, therefore, a note of warning has to be sounded as to the possible risks of blood transfusion in every case, it should not, however, be thought that blood transfusion is not a valuable form of therapy in certain cases of severe anæmia. The exact procedure to be adopted will be discussed in another chapter, but it is sufficient at present to state that it is a mistake in such cases to give a large blood transfusion. A greater amount of good will probably result from repeated transfusion with small quantities of blood. One need hardly emphasise the care that should be taken in the matching of the blood before transfusion is attempted, whether it be with whole blood or with citrated blood.

THE CONDUCT OF LABOUR

It has already been suggested that labour adds considerably to the risks if the patient has not shown marked improvement

after the commencement of the treatment. It is therefore obvious that *induction of labour has no place in the treatment of pernicious anæmia, or for a matter of that in the treatment of any variety of anæmia during pregnancy.* The longer this inevitable event can be postponed so as to gain time to improve the general condition, and particularly the hæmopoietic system of the patient, the greater is the possibility of survival of mother and child.

So far as labour is concerned, in many cases it is precipitate. Premature labour is not infrequent; but should the condition sufficiently improve, labour may come on at full term. Particular care should be taken to see that there is no risk of puerperal sepsis. Interference should be limited to the minimum extent possible. Help in the second stage of labour may be needed to save the strain on the damaged heart. All operative procedures should be conducted with meticulous care as regards the avoidance of sepsis. Anæmic patients are more likely to develop sepsis during the puerperium.

The Puerperium. The patient should be watched with care. All exertion should be forbidden; the diet should be light and nutritious, liquid nourishment for the first few days being desirable. Liver therapy should be continued; glucose may be given at frequent intervals. The patient should not be allowed to sit up too soon, and should be warned that the treatment should be continued for a sufficiently long time. In the severer types of anæmia it is better to forbid breast-feeding.

THE SECONDARY ANÆMIAS

There are a number of conditions which give rise to secondary anæmias during pregnancy and puerperium. These are generally of the microcytic, hypochromic type. Nutritional deficiency of various sorts, focal sepsis, poisons such as lead, the toxæmias of pregnancy, puerperal sepsis, diseases such as malaria, kala-azar, tuberculosis, intestinal parasites, syphilis, sudden antepartum or postpartum hæmorrhage may all give rise to secondary anæmia, sometimes of a mild and sometimes of a very grave nature. Particularly in the tropics, there are a number of diseases which give rise to destruction of the red cells and diminution in the quantity of hæmoglobin, thus causing a severe type of anæmia, characterised by a low colour index and diminution in the size of the red blood corpuscles. The particular routine examination that has already been suggested should be adopted in every one of these cases.

One of the most common causes of anæmia in the tropics is hookworm infection, and this is so frequently met with and is associated with such a heavy mortality in cases untreated or neglected, that it is desirable to have a thorough knowledge of this disease as it affects pregnancy.

It has already been suggested that there is, what may be called a physiological anæmia of pregnancy which is probably due to hydræmia in pregnancy, so that the hæmoglobin is never 100 per cent. but varies between 80 and 90 per cent.

Treatment of Secondary Anæmias. The part played by anæmia in pregnancy has been referred to in detail, and it has been suggested that where the hæmoglobin content is below 50 per cent., the prognosis for the mother is less favourable and the chances of premature termination of pregnancy are greater, the lower the hæmoglobin content is. It should therefore be an imperative rule to treat the anæmia whenever it complicates pregnancy by (1) removing the causative factor concerned and (2) making good the blood deficiency. Removal of the causative factor is of prime importance; but in view of the severe anæmia it may be necessary that the patient should be properly dieted, treated for anæmia, kept at rest and general stimulants given for periods varying from one to two weeks before the causative factor can be tackled. In some cases it is possible that both methods of treatment may be simultaneously adopted.

Treatment consists in supplying the deficiency, whether it be in the form of vitamins or in the form of hæmatinics. The appropriate treatment can only be elucidated by careful clinical and hæmatological study. It is no use prescribing iron, for instance, when the anæmia is due to a deficiency disease like scurvy, or to an endocrine disorder like myxædema. The patients who are severely anæmic should be confined to bed, a generous mixed diet rich in vitamins should be given. It is desirable, whenever possible, to give fresh liver two or three times a week. Fresh air and sunshine and ultra-violet therapy are ancillary methods of treatment. Iron is of great use in the majority of anæmias with low colour index, especially those where defective absorption of iron is the principal factor. The various preparations of iron differ greatly in their properties. The ferrous salts are most active, the scale preparations come next, and then the ferric salts. Organic preparations of iron have less therapeutic value. Ferrous carbonate is very suitable. Large doses of iron should be given; if it is to be effective, 60 to 120 grains of the scale preparation of iron and ammonium citrate should be given daily in divided doses after food.

Hydrochloric acid is of value in the treatment of the dyspepsia in some cases of anaemia— $\frac{1}{2}$ to 1 drachm of the dilute acid being given before each meal.

Arsenic is another drug which is found useful along with iron. Other drugs that may be combined with iron therapy are copper and manganese. Liver therapy will be found beneficial in a proportion of cases.

Diseases of the Urinary System

The kidneys play a prominent rôle during pregnancy, as they have to excrete not only the products of increased maternal metabolism but also those of the foetus. The strain, therefore, is great and if the kidneys were previously damaged, however slight, it is likely that this additional strain will result in increased damage. Even with healthy kidneys, under certain circumstances the strain may be too great. The condition of the kidneys should therefore be particularly watched during the whole period of pregnancy, and every effort should be made to diagnose and treat any pathological changes sufficiently early to prevent the more permanent damage of the organ and onset of more serious symptoms.

A thorough examination of the urinary system in pregnancy or the puerperium involves the following clinical tests:—

(1) **Renal Efficiency Test.** This can be done by one of the following methods:—

(a) *Urea Concentration Test.* In this test, 15 grams of urea dissolved in 100 c.c. of water and flavoured with tincture of aurantii are given to the patient just after she has emptied her bladder. Samples of urine are collected after one, two and three hours, and the urea is estimated by the hypobromite method. If this amounts to 2 per cent. or over in one or more of the three specimens, the kidneys are efficient. The volume of urine should not exceed 120 c.c. in the first hour or 100 c.c. in each of the second and third hours. Excessive diuresis may be due to release of water previously retained in the tissues and the test should be repeated.

(b) *The Blood Urea Clearance Test.* This is a simple and more reliable test of estimating the urea excreting function of the kidneys. The principle of it is based on the relation of the blood urea concentration to the urea concentration in the urine secreted. The urine is collected at two periods with an interval of one hour, the bladder being completely emptied on each occasion. Food is withheld for two hours previous to the test. Blood is taken for

urea determination in between the two collections of urine. The urea content of the urine is estimated and the output of urea per minute calculated. If the blood urea concentration is now determined, the volume of blood cleared completely of urea can be calculated. A urea clearance of 50 or under is certain evidence of chronic nephritis.

(2) **Bacteriological Examination of Urine and Culture of the Same.** This is very necessary in all cases where a urinary infection is suspected, to establish the diagnosis and determine the organisms concerned. It is our experience that the majority of cases of prolonged puerperal pyrexia are due to a urinary infection, either primary or secondary.

(3) **Cystoscopic Examination.** This is sometimes of great value in determining the condition of the bladder and the presence of inflammation therein. It may be combined with catheterisation of the ureters, which is useful as a therapeutic measure as well as a method of determining the presence or absence of infection in the pelvis of the kidney.

(4) **Radiographic Examination.** Pyelography is a valuable means of determining the position and condition of the kidneys, the presence of calculi, hydronephrosis, dilatation of the pelvis, renal growths and tumours, dilatation and irregularities in the course of the ureter. A drug opaque to X-rays, which is eliminated by the kidneys, is introduced intravenously and radiograms are taken at short intervals after its injection. Uroselectan B is generally used for this purpose. Another method of examination of the pelvis and ureter is by an X-ray taken after the introduction through a ureteral catheter of a 12 per cent sodium iodide solution. This is called retrograde pyelography.

Manifestations of Renal Damage. During pregnancy the kidneys may show evidence of damage from any of the following causes:—

(a) A previously damaged kidney from any of the varieties of nephritis may, during pregnancy, show evidence of increased damage owing to its inability to cope with the increased strain. The woman may have suffered from acute or chronic nephritis prior to pregnancy.

(b) Acute nephritis may develop during the course of pregnancy in a kidney which has not been the seat of previous disease.

(c) An acute nephritis may be superimposed on a previously damaged kidney, the seat of a subacute or chronic nephritis.

(d) **Occult nephritis.** In this condition the disease may be latent during the non-gravid condition, but when pregnancy super-

venes, particularly in the latter half of pregnancy, the symptoms manifest themselves clearly.

All forms of nephritis have a deleterious effect on pregnancy, causing either abortion, premature labour or intra-uterine death of the foetus in the majority of cases.

(e) Besides these different forms of nephritis, the toxæmic kidney of pregnancy, which later may result in eclampsia, has been discussed in the chapter on toxæmias of pregnancy.

The *diagnosis of nephritis* is made by an examination of the urine. It has already been emphasised that this should be a routine practice during the whole course of pregnancy, particularly after the twenty-fourth week. The presence of albumin will first arouse suspicion as to the possibilities of a nephritis. The specimen should always be a catheter specimen, and it is desirable that the other causes which may result in albuminuria, such as cystitis, should be eliminated.

When an acute attack of nephritis supervenes on a latent nephritis the prognosis is grave. It is rendered worse by any complication such as oedema of the lungs, ascites, effusion into the pleura or albuminuric retinitis. In some cases eclampsia may supervene.

Treatment. In the presence of chronic nephritis the woman runs a serious risk when she becomes pregnant. When renal inefficiency has been manifest in the previous pregnancy by an attack of eclampsia or otherwise, it is desirable that the woman should be examined at periodic intervals and a renal efficiency test performed before she runs the risk of another conception. Should, however, pregnancy occur in a case where there has been previous evidence of diseased kidneys, the patient should be watched with great care from the commencement of pregnancy. The obstetrician should be on the lookout for any of the early symptoms of pre-eclampsia and should be prepared, if the condition cannot be brought under control, to induce labour. Albuminuric retinitis, persistent anasarca, a damaged heart, persistent high blood pressure, or an increasing degree of albuminuria, despite all treatment for over a week, usually necessitates interruption of pregnancy, particularly if the foetus has passed the period of viability.

When, however, the nephritis is discovered in the early weeks of pregnancy, the question arises whether pregnancy should be allowed to continue. It is difficult to lay down any dogmatic rule; but if careful dietetic treatment, rest and general measures do not produce an appreciable improvement, it is desirable to interrupt pregnancy for the following reasons. It is rarely that the preg-

nant woman can be safely tided over till the child is viable without some acute manifestations appearing. Secondly, the child does not survive in many of these cases, and thirdly the prolonged damage to the kidney in association with pregnancy impairs the life of the mother to such a serious extent that it is questionable whether it is justifiable to allow the pregnancy to continue. On the other hand, if the foetus is near the period of extra uterine viability (34-35 weeks) it is perhaps permissible to temporise for a week or so in order to give the child a better chance of survival.

Careful examination of the urine, quantitative estimation of the albumin and the total quantity of the urine voided in twenty-four hours, estimation of the blood urea and non-protein nitrogen content, a record of the blood pressure and the associated signs and symptoms, together with a periodic examination of the retina for signs of albuminuric retinitis, should be a matter of routine. Dietetic and medicinal measures for the relief of the strain on the damaged kidney must be instituted. These have been dealt with in detail in the chapter on toxæmias.

Just before or during labour, if there is any swelling of the labia, it should be relieved by painting with tincture of iodine and then puncturing them. Hot compresses are very useful in cases of œdema. The second stage of labour should be terminated as soon as possible by the application of forceps or by extracting the child in breech presentations. As labour is more often premature, there may not be much difficulty in terminating it. The third stage of labour may be complicated by adherent placenta and consequent P.P.H. Hence, manual removal of placenta with treatment of postpartum hæmorrhage may be necessary in such cases. The puerperium requires added care in view of the possibilities of infection, both urinary and general.

Urinary Infections in Pregnancy

PYELITIS, PYELONEPHRITIS AND URETERITIS

It is not often realised what a dominant part urinary infection plays in the causation of serious symptoms during pregnancy. In the majority of cases, the symptoms are mild and the infection clears up before much mischief is done. In some cases, however, severe symptoms manifest themselves leading to the condition known as *pyelitis gravidarum* and sometimes sepsis in the puerperium.

To appreciate fully the causes which lead to infection of the urinary tract during pregnancy, it is necessary to recognise the

anatomical and physiological changes that occur in the tract during the course of pregnancy.

The Anatomy of the Ureters. The ureter in its lumbar and iliac portion lies in contact with the aponeurosis of the psoas muscle about one finger-breadth from the spine. In front it is in intimate relation with the posterior peritoneum. It has a wide range of mobility in its abdominal portion, a fact to be borne in mind in considering the changes that occur during pregnancy. At the pelvic brim, the ureters cross the iliac vessels obliquely, where the common iliac artery divides into the internal and external iliac arteries. At this point, there is a difference in the two sides due to the difference in the course of the common iliac vessels. The right common iliac vessel crosses the vertebral column from left to right and therefore lies more anteriorly than the left. As the right ureter must cross over the right common iliac vessels almost at a right angle to enter the pelvis, it has a more exposed course than the left, which is partly protected by the promontory of the sacrum and the sigmoid colon and its mesentery which lie anterior to it.

Physiological Changes. The physiological changes that occur in the urinary tract during pregnancy have an important bearing on the pathology of the urinary tract during pregnancy and puerperium. Baird summarises the changes in the ureter during pregnancy and states. "In general the changes are most marked in primigravida and on the right side, and least marked in multiparæ and in the left ureter. The series of changes in an average primigravida, in the right ureter is that at the second month there is some delay in excretion and irregular action of the ureter due to reduced tone. During the third month there is a recovery of tone and increased rate of excretion. During the fourth month the tone is again diminished, particularly on the right side, and becomes progressively more obvious throughout the fifth month until the sixth month. From the sixth month till term there is often a recovery of tone with improvement in the rate of excretion which on the left side, may become quite normal just before labour. Ureteric peristalsis is regular during the later weeks, but despite this the right ureter may remain dilated and cause retention of urine within its dilated portion." The most constant changes are dilatation of the pelvis and calyces of one or both ureters and lateral displacement of the structures. The right kidney and ureter are affected more often than the left. But the left ureter is displaced laterally more frequently than the right. The cause of ureteral dilatation is two-fold: (1) the primary changes in the ureter are due to hormonal factors especially the action of pro-

gestine which produces a diminution in the tone of all smooth muscles including that of the ureter in action and (2) the pressure of the uterus causes a constriction at the pelvic brim. The uterus, ureters and large bowel undergo an atonic change which commences during the early months of pregnancy and persists until the 32nd week, when it slowly diminishes, so that at term the uterine musculature is not only irritable but contracts vigorously. The ureter, in its relaxed state, is unable to expel the urine excreted by the kidney because of the steadily increasing weight upon it as it gradually dilates; in so doing, it contains an increasing column of more or less static urine. Residual urine, whether it occurs in the bladder, ureter or pelvis of the kidney, is a source of danger which has long been recognised by urologists, as it is prone to infection, and once contaminated, allows of such rapid growth of micro-organisms as to make it difficult for a cure so long as the stagnation persists. The pregnant woman, with her dilated ureters, is therefore in constant risk of developing an upper urinary tract infection, but as only 2 per cent. of the patients develop pyelitis gravidarum, there must be some protective force at work.

How does the infection occur? There are four channels by which the infection may spread to the urinary tract under favourable circumstances:—

- (a) by the blood stream.
- (b) by the lymphatic channel.
- (c) as an ascending infection along the ureter.
- (d) directly from the intestines.

The immediate proximity of the ascending colon to the right kidney pelvis gives rise to the possibility of a primary isolated infection of the pelvis of the right kidney by way of the lymph stream or by contiguity.

Bacteriology. The dominant organism responsible is the *bacillus coli*. The presence of the colon bacillus in the urinary tract is the result of two factors: (1) the constant penetration of the bacilli from the intestinal tract, and (2) the multiplication of these bacilli in the urinary tract. There is a definite relationship between the pathological condition in the intestinal canal and the occurrence of pyelitis in the urinary tract. In cases of pyelitis, it is necessary to pay special attention to the function of the intestines, and the problem of rendering the bacterial flora of the intestines normal should be tackled.

Among other micro-organisms may be mentioned streptococci, staphylococci, pneumococci, gonococci and the typhoid and paratyphoid group of bacilli, alone or in combination with the coli organisms.

The methods used to study the effect of infection on the urinary tract are:—

- (a) Chromocystoscopy.
- (b) Catheterisation of the ureters.
- (c) Determination of the urea concentration of the urine of each kidney.
- (d) Urea clearance test.
- (e) Intravenous pyelography.

Urinary infection may occur at different stages of pregnancy.

(a) *First trimester and early part of the second trimester*, i.e., up to the 20th week. At this period, the most dominant factor in the causation of urinary infection is displacement of the gravid uterus. The commonest displacement is a backward displacement, retroversion or retroflexion. Sometimes prolapse occurs; in such cases the cervix is displaced, pulling with it the bladder and urethra and constriction results. The inability to pass urine, results in stasis and decomposition, allowing organisms to gain admission freely. In some cases the urinary infection is so pronounced that termination of pregnancy becomes necessary. Urinary antiseptics, free drainage of the bladder and correction of the displacement of the gravid uterus are methods of treatment to be adopted. When the gravid uterus gradually rises into the abdomen and spontaneous rectification occurs there may be alleviation of the symptoms.

(b) *Urinary infection during the second and third trimesters of pregnancy*. At this period the result of infection is a pyelitis, pyelonephritis or pyelocystitis. The most important factor responsible for infection during this period is urinary stasis. It generally occurs between the 20th and 36th week, being most frequent between the 24th and 32nd weeks of pregnancy.

Signs and Symptoms. Cases of pyelitis of pregnancy can be divided into two groups, acute and chronic, according to the severity of the urinary symptoms. Pyelitis is more common in primiparæ than in multiparæ; occasionally it is met with in the puerperium, when it is likely to be mistaken for uterine infection. The patient might have been enjoying comparatively good health; slight attacks of pain in the region of the kidney may be complained of, or perhaps painful micturition. There is usually a dull aching pain in the right flank, associated with fever, chills, sweat-

ing, malaise and sometimes nausea and vomiting. This is preceded by dysuria and hæmaturia.

On palpation in the flanks, the kidneys may be tender and tenderness may also be elicited along the ureters. There is tenderness in the costo-vertebral point of greatest tenderness is at the junction of the the lumbosacral muscle with the lower margin (Cova's point). The urine is cloudy and contains blood corpuscles and many bacteria. The latter are *coli*, with sometimes staphylococci and streptococci invaders. The temperature runs a hectic course frequently associated with chill. The urine becomes sterile before the end of pregnancy and during the course of pregnancy are common. In pyelitis, miscarriage or premature labour may occur.

Diagnosis. The diagnosis of these complications is little difficulty, provided the fact is borne in mind that in this period of pregnancy they are not infrequently associated with fever of the character of the malaria and the urinary findings with tenderness and enlargement of the kidneys and the palpable ureters, make it clear that the condition is due to pyelitis. The pain, however, may simulate that of other conditions such as of influenza, miscarriage or premature labour, appendicitis and other abdominal conditions. A bacteriological examination of a specimen of the urine should always be made.

In the tropics the frequent rigors and the sudden prompt dropping of the temperature to normal are suggestive of malarial infection. A careful examination of the blood must help to differentiate this condition from true malaria.

Occasionally, pyelitis may be complicated with sepsis in which case the diagnosis can only be made by a careful examination of the blood and urine and a Widal's test.

Prognosis. In the majority of cases, if the condition is promptly treated at the early stages, recovery is complete. The possibility of recurrence and exacerbation during puerperium should be borne in mind. The condition is more dangerous in primiparæ than in multiparæ. It may terminate prematurely or may have to be in some cases giving an unfavourable prognosis for the child. A rigor, associated with rise of temperature, labour pains and disease may progress to pyelonephritis, ascend

nephritis, pyonephrosis, perinephritic abscess and pyæmia. Such complications render the prognosis graver.

Treatment. Conservative methods of treatment are most usually adopted for this condition. In the acute cases, associated with rigor, fever and severe pain with urinary symptoms, the patient should be immediately put to bed and the diet should be bland and liquid, milk, glucose water, fruit juice and aerated drinks being largely given. The fluid intake should be sufficient to favour a free diuresis. Five to 8 pints of fluid may be given in the twenty-four hours in the form of water, barley water, imperial drink, lemon drink, weak tea and thin soup. In some cases instead of milk, junket, butter-milk, whey and cream may be tried. The bowels should be regulated, and it is desirable to give intestinal antiseptics to inhibit the growth of organisms in the intestinal tract. As the temperature subsides the diet is increased by the addition of carbohydrates, fruits, vegetables and fat. Alcohol should be withheld. In the initial febrile stage, sufficient alkalis should be given by mouth to make the urine alkaline. Thirty grains of potassium citrate with an equal quantity of sodium bicarbonate, with 10 to 15 minims of tincture hyoscyamus may be given every two hours until the urine is alkaline. Every specimen of urine should be tested with litmus paper. When the urine is alkaline, the quantity of alkali given by mouth may be reduced, by giving it at six or eight-hourly intervals, until the temperature has been normal for a week and the acute symptoms have subsided. The urine is then made acid with acid sodium phosphate, 15 to 30 grains, and hexamine 10 to 15 grains, given three times a day after food. Other drugs that can be given instead of hexamine are cystopurin, 15 grains three times a day; hexyl resorcenol 2 to 3 grains. A change of urinary antiseptics is sometimes advisable. In some cases hexamine with methylene blue may prove less irritating than hexamine alone, and may be given without the addition of an acid mixture. When *bacillus coli* has been isolated in cases of pyelitis, cyclotropin has been found useful and may be given either by the intravenous or the intramuscular route. The latter is preferred as occasionally severe reaction results from the intravenous administration, which may lead to interruption of pregnancy and sometimes even collapse.

Mandelic acid is definitely superior to other drugs in urinary infection. Several preparations of this drug such as Ammoket, Neoket, etc., are on the market which can be tried. Apparently it is most effective against *bacillus coli* and less so against staphylococci, streptococci, *bacillus pyocyaneus*, *proteus*, etc. The

use of this drug and the dietetic method of treatment described later, has been largely discarded in favour of Sulphonamide therapy. There are however a number of cases where the causative organism is resistant to the Sulphonamide group of drugs but yields to mandelic acid. The chief points to note in the treatment are that regularity of dosage is maintained and the in-take of fluid is restricted to 2 pints or less. The restriction of fluid is essential to reduce the PH of the urine to 5.5 or less. If the PH figure is above, the acidity is not sufficient to destroy the organisms. The PH of the urine must be examined every morning by the indicator (add a few drops of methyl—red or universal indicator—B.D.H.) to half a test tube of urine. The colour table on the label of the bottle gives the figure of the PH), to ensure that a sufficient degree of acidity is being maintained. Where it is impossible to reduce the PH to 5.3 despite strict treatment, the presence of *B. Proteus* may be suspected. The treatment must be maintained for ten to fourteen days if necessary. Mandelic acid is a mild irritant to the kidneys and hyaline or granular casts and R.B.C. may be found for a short period. Mandelic acid therapy is particularly valuable after labour where the ureteric condition returns to normal and particularly for cases resistant to Sulphanilamides.

Auto-vaccines may also be used in suitable cases.

In recent years, a ketogenic diet has been introduced in the treatment of this condition. This is based on the observation that when such a diet is given to patients suffering from other diseases, the urine passed does not putrify on standing for several days; hence the diet will inhibit the growth of micro-organisms, ultimately rendering the urine sterile. The ketogenic diet contains a preponderance of fats over carbohydrates and proteins, the proportion being 6: 1 as fat is to carbohydrates plus proteins. The diet is usually required for one to three weeks. The fluid intake should be limited to 2½ pints and it is essential that no other food should be taken between meals.

When improvement does not still take place, ureteral catheterisation, as a method of treatment, has been strongly advocated. Catheterisation of the ureters removes the factor of urinary stasis and permits free drainage of the kidney pelvis. Catheters are inserted into both ureters in spite of unilateral preponderance of signs and symptoms. They are left in place for four to six days and are reinserted if necessary.

The question of termination of pregnancy is an important one for consideration. Pyelonephritis, particularly when bilateral, may indicate the necessity for emptying of the uterus.

Sulphanilamide Therapy. Since the use of sulphanilamides the treatment of pyelitis of pregnancy has undergone radical change in the large majority of cases. The method of administration of these drugs and their relative potency, together with type of organisms for which the particular drug is most suited will be discussed in a later chapter.

BACILLURIA

This is not an infrequent complication in pregnancy. It occasionally manifests itself in an aggravated form in the puerperium. The need for a thorough examination of the urinary tract during pregnancy, and in some cases during the puerperium, is obvious from the large number of cases of puerperal infection which are complicated with infection of the urinary tract. In fact, it is well to remember, in the treatment of puerperal sepsis, that such sepsis may have originated from a bacilluria.

Diseases of Metabolism

DIABETES

During pregnancy the presence of sugar in the urine is not infrequently demonstrated by any of the ordinary tests such as Fehling's or Benedict's. The presence of sugar, however, does not necessarily indicate the presence of true diabetes. As a matter of fact the occurrence of glycosuria in pregnancy may be due to several causes, namely :—

- (1) An innocent form of glycosuria due to diminished sugar tolerance in pregnancy.
- (2) A glycosuria innocent in itself but possibly suggestive of a commencing toxæmia.
- (3) A lactosuria due to hyperfunction of the breasts.
- (4) Disturbances of the endocrine system.
- (5) True diabetes mellitus.

It is of importance to differentiate these conditions and to establish definitely whether true diabetes is present or not. This can only be done by a sugar tolerance test and the study of the blood sugar curve.

Effect of Pregnancy on Diabetes. A diabetic woman may become pregnant; more rarely a woman who is pregnant may develop diabetes. In some cases the woman may not be affected at all by the presence of diabetes, while in others she may improve and have better health, particularly in the later weeks, due probably to the activity of the foetal pancreas. On the other hand,

in a few cases an aggravation of the symptoms occurs and the disease may take on a more severe form during pregnancy. Cases have been recorded where diabetes has occurred during pregnancy and has disappeared after labour; while in some cases, although there is a great improvement after the confinement, the disease reappears later on.

Pregnancy may light up a latent diabetes, and unless the condition is controlled there may appear some of the complications of diabetes mellitus, such as acidosis, coma, etc.

Effect of Diabetes on Pregnancy. So far as the foetus is concerned, diabetes has an adverse effect. The foetus generally is excessive in size. This may be due to the unusual amounts of sugar brought to the placenta by the maternal blood. In some cases of true diabetes that have been under our observation, the children weighed between 12 and 14 lbs. at birth. A fair proportion of pregnancies end in abortion or premature labour, and it is not uncommon to find that over a third of the children born at term are stillborn or macerated. Not infrequently the foetus dies *in utero* near term.

Diagnosis. The diagnosis of this condition rests upon the clinical symptoms of polyuria, polydipsia, bulæmia, etc., together with the presence in the urine of sugar, acetone, diacetic acid, or beta-oxybutyric acid, and upon the estimation of the blood sugar and nature of the sugar-tolerance curve.

Prognosis. This depends upon the severity of the attack and the treatment adopted and the co-operation on the part of the patient. Before the discovery of insulin and modern methods of treatment of this condition, the disease was dreaded during pregnancy and the prognosis was undoubtedly grave. While the prognosis has improved so far as the mother is concerned, the foetal prognosis is still bad. Apart from the tendency for interruption of pregnancy before term, the excessive size of the child leading to severe dystocia, the sudden death of the foetus at or near term, and the increased risks of neonatal mortality render the prognosis unfavourable.

Treatment. When diabetes has been diagnosed in pregnancy, the patient should be watched and kept under dietetic and medicinal treatment. The advice of a physician should be obtained from time to time.

The principles of treatment are:—

- (1) The blood sugar of the patient should be estimated from time to time and kept within the normal limits of .08 to .12 mgm. per cent.

(2) The urine should be frequently examined for the presence of acetone, diacetic acid, etc., and prompt measures taken to see that these disappear from the urine.

(3) The life of the patient should be so regulated that no extra strain, physical or mental, is allowed.

In the mild type of case, moderate restriction of carbohydrates may be sufficient to prevent glycosuria, but in the majority of cases this is quite inadequate. A suitable dietary should be drawn up and with the use of insulin it is not difficult to tide over the period of pregnancy safely.

The conduct of labour requires care. It is rarely necessary to resort to termination of pregnancy in the early half of gestation.

The question may have to be decided whether, with an excessively large-sized foetus, it is not necessary to resort to the abdominal mode of delivery. We feel, after experiencing the difficulties of vaginal delivery with large foetuses, that if the foetal heart sounds were good, abdominal delivery would save the mother the grave risks incidental to a difficult vaginal delivery and favour a live birth.

It has been noted that in certain cases sudden death of the foetus occurs in the last weeks of pregnancy. How far this may be due to a hyper or hypo-glycaemia is not definitely known. If a previous history is available of such intra-uterine death occurring, it is safer to terminate pregnancy at the thirty-sixth week. Another indication for termination is the excessive growth of the foetus *in utero*; the size of the foetal ovoid and history of previous delivery would help one to decide this question.

The risks of puerperal sepsis must be borne in mind and the patient should be carefully nursed and the urine periodically tested for any signs of acidosis. In the milder forms of the disease lactation may be permitted.

Hypothyroidism and Thyrotoxicosis

HYPOTHYROIDISM

In this condition sterility is generally the rule, but occasionally a pregnant woman may develop signs and symptoms of myxoedema either in association with a colloid goitre or independent of it. In the majority of such cases abortion or miscarriage results. If, however, the symptoms appear at a late stage in pregnancy the child is likely to be born a cretin. Occasionally, congenital goitre has been noted. The use of adequate doses of thyroid extract is indicated in all such cases, and cases have been reported where pregnancy has been carried to term by the administration of

thyroid. Care must be taken with the new-born to note any symptoms of hypothyroidism and to treat the condition at an early stage.

THYROTOXICOSIS

This grave affection, though rare, occasionally complicates pregnancy. The onset may be sudden or insidious. It may occur during pregnancy or may ante-date conception. In some cases there is a marked increase in the severity of the symptoms of thyrotoxicosis with the onset of pregnancy. Occasionally, however, the toxicosis may diminish late in the course of pregnancy with an exacerbation during labour and gradual subsidence during the puerperium.

The usual signs and symptoms of the condition may be noted. Palpitation and rapid action of the heart are troublesome and severe symptoms; with the increasing growth of the uterus the gravity of the cardiac symptoms increases. The majority of these cases are mild in nature and can be controlled by medicinal methods of treatment. The diet should be nutritious and generous so as to give enough calorific value to meet the increased metabolism. The chief drug which is relied upon is iodine. This is given generally in the form of Lugol's iodine, and the dose is gradually increased—2 to 10 minims being given three or four times a day. After a fortnight, iodine therapy may be temporarily stopped and started again if symptoms manifest themselves. For the mental irritability bromides and luminal may be prescribed. The tachycardia may be controlled by judicious administration of digitalis.

The question of surgical therapy in these conditions has been much discussed. Part of the thyroid gland may be destroyed or removed by surgical operation or the application of radium or X-rays or by ligation of blood vessels. In the majority of cases it would appear that these methods are not indicated during pregnancy. But once pregnancy has been terminated, it is desirable to insist upon a fairly prolonged interval before another pregnancy is risked.

The question of terminating pregnancy during the disease, either by inducing abortion or premature labour, has also been discussed. From our experience we are against any such interference, as in the majority of cases pregnancy can be carried to term; and where interruption occurs by natural means the prognosis is distinctly better than if artificial methods of induction are attempted.

Diseases of the Gastro-intestinal Tract

DYSENTERIES

Dysentery is by no means an infrequent complication in pregnancy. Sporadic cases are always present and occasionally it may occur almost in an epidemic form particularly in the tropics.

There are two types of dysentery that may occur:—

- (1) Bacillary dysentery, which is an acute colitis caused by specific dysentery bacilli and characterised clinically by an attack of fever, frequent small mucoid or mucosanguineous stools, with tenesmus and griping.
- (2) Amoebic dysentery, which results from infection with *Entamoeba histolytica*, and is characterised generally by afebrile diarrhoea, frequent stools containing brownish mucus and dark red blood.

Both forms of dysentery are very common in the tropics and occur in pregnant women just as frequently as in the non-pregnant.

BACILLARY DYSENTERY

This severe complication may be associated with a fairly high degree of morbidity and mortality in pregnant woman, unless suitably treated. Occasionally the infection is mild; but in some cases, particularly if due to the Shiga bacillus, it may be severe. Toxæmia and dehydration play an important rôle in the clinical picture. Fulminant types are as frequently met with as chronic ones. The bowels may be opened from five to fifty times a day, and at the height of an attack, abortion, miscarriage or premature labour may occur. The severest cases may die in a state of collapse with subnormal temperature and cold extremities. In the ordinary acute cases the stools rapidly lose their fæculent character and consist more of mucus with bright red blood.

Diagnosis. It is of the utmost importance that whenever dysentery occurs in a pregnant woman, early steps should be taken to find out, after ascertaining the clinical history and examining the patient carefully, the causative organism concerned. Immediate microscopic examination of the stools should be made. A large number of polymorphonuclear leucocytes along with red blood corpuscles may be present. The stools should be sent for culture, which will give a high percentage of positive results. It is not desirable, however, to wait for the culture result, but treatment should be

undertaken for an acute condition such as this, and we prefer to treat every case as one of possible bacillary dysentery, unless *Entamoeba histolytica* has been definitely found on examination. On the other hand, it must not be forgotten that a combination of the two types may be present—the amoebic as well as the bacillary; and if the effects of treatment do not produce any definite response for the amoebic infection, it may be presumed that the dysentery is probably a mixed infection.

Treatment. Prophylactic measures are undoubtedly useful in the presence of outbreaks of dysentery in the locality. Treatment should generally aim at promoting rest and counteracting the toxæmia and dehydration. The diet should be regulated. For the first day only water or small quantities of albumin water or barley-water should be given. Later clear soups, arrowroot and sago conjees may be allowed. Glucose may be given at frequent intervals. A preliminary dose of castor oil ($\frac{1}{2}$ oz.) with tincture opii (10 to 15 minims) may be given, followed by drachm doses of sodium sulphate every two or three hours till the stools lose their dysenteric character. Anti-dysenteric serum should be given early in the disease, and in the Shiga infection the serum may be given intravenously. For the dehydration hypertonic saline or gum arabic solution is useful intravenously. Adrenalin, 0.5 c.c. of 1 in 1000 solution, may be given for the collapse.

In recent years much progress has been made with the use of the specific bacteriophage given thrice daily or every four hours, particularly in the severe cases. In other cases polyvalent anti-dysenteric serum may be given in large doses of 30 to 40 c.c., and repeated for three days. Care should, however, be taken to see that the patient is desensitised, if necessary, before the serum is given. The introduction of Sulphonamide therapy in this as in so many other bacterial infections, has revolutionised the treatment of Dysentery. The chief drug used is Sulphaguanidine, but Sulphathiazole and Sulphamerazine are also under trial. Sulphaguanidine is used with a recommended dosage based on body weight. Since however it is impracticable to weigh the acute case and since the drug is nontoxic a standard dosage regardless of the patient's weight may be adopted. An initial dose of 4 to 6 gm. is given and thereafter the drug is continued in doses of 2 to 3 gm. at four hour intervals until a fecal porridgy stool and general clinical improvement have been maintained for two or three days; 3 gm. three times daily is given for three or more days thereafter. The average effective dose is not less than 50 gm. and is usually 100-150 gm.

AMOEBIĆ DYSENTERY

AMOEBIĆ DYSENTERY

This is due to the infection of the colon with *Entamoeba histolytica* and occurs mainly in the tropical and subtropical regions. The symptoms differ from those of the bacillary dysentery in that the onset is generally insidious, commencing with afebrile diarrhoea. Occasionally, however, the onset is acute, as in bacillary dysentery, with fever, pain, griping and purging associated with frequent bloody mucoid stools. In the majority of cases, however, the signs of toxæmia are not present. Many of these cases run a chronic course, and even without specific treatment the tendency for amoebic dysentery is to improve temporarily. Relapses are frequent and very characteristic of the disease.

The diagnosis is usually made by examining the mucus from a fresh stool under the microscope, when the *Entamoeba* will be easily recognised.

The disease can be easily brought under control with the use of emetine injections, intramuscularly or subcutaneously, in 1 grain doses daily for a period not exceeding ten days. Emetine bismuth iodide is preferable to emetine in chronic cases and in carriers who show the cysts of amoebæ. It is best given on an empty stomach, late at night, in gelatine capsules, four hours after the last feed. Yatren No. 105 may also be given by the mouth. It is generally advisable after the acute stage is over to continue the treatment with yatren pills. In the chronic cases, particularly where amoebic cysts are present, a combination of yatren and emetine bismuth iodide is desirable. It must be realised that amoebic dysentery may sometimes lead to amoebic hepatitis and later to hepatic abscess if neglected.

It is rare for pregnancy to be interrupted, but if the woman is near term and the condition is acute, labour may set in.

In the puerperium particular care should be taken with all forms of dysentery to see that septic infection does not occur. Careless handling of the external genitals by the patient or midwife has sometimes been responsible for the causation of puerperal sepsis.

A type of dysentery very common in the tropics in the puerperium, which is attended with a high degree of mortality and morbidity and severe anaemia, is due generally to the Flexner infection. In other cases the dysentery might occur for the first time in the puerperium, the patients having been carriers of infection for a long time previously.

Diseases of the Nervous System**CHOREA GRAVIDARUM**

This is a somewhat rare complication of pregnancy, occurring in young primigravidae. The disease is characterized by the occurrence of spontaneous involuntary movements, in time, place of occurrence and nature, and by the interference with the voluntary movements together with muscular weakness and a variable degree of psychic disturbances.

The disease generally occurs in the first trimester and is liable to recur with subsequent pregnancies; it almost always appears as if the pregnancy was the cause of the condition.

Clinical Features. The onset is usually gradual. When the disease is well marked the characteristic symptoms are:

- (1) Involuntary movements.
- (2) Ataxy or loss of precision of voluntary movements.
- (3) Weakness of voluntary movements.
- (4) Emotional instability and other psychic disturbances.

The involuntary movements are always irregular in time and nature of their occurrence. In severe cases it may be difficult, the words being articulated slowly and in single syllables. In the upper extremities the movements are most marked in the hand. The lower extremities are generally affected. The gait tends to be clumsy and insecure. The face is usually the first region to present movements, and it is usually bilateral. So far as the limbs are concerned the movements may be confined to one side, more often to the lower extremities. The movements cease during sleep and, except in severe cases, are more or less controlled by voluntary effort. It is usually shown in the mild cases by incapacity for exertion and fatigue.

Incoördination of voluntary movements may be present from the beginning and it may progress to choreic movements. Psychic disturbances are common, some degree of emotional instability, nervousness and depression being present in most cases. The patient's behaviour may change; she may laugh or weep without cause, become capricious, irritable and obstinate. Cardiac symptoms may manifest themselves later in chorea. The disease tends to a spontaneous termination after a variable period, from six weeks to six months.

Prognosis. A small proportion of cases, although mild at first, end fatally. In pregnancy, however, chorea is usually

higher mortality than in the non-gravid condition. Death from chorea in pregnant mothers results more often from abortion, whether spontaneous or artificially induced; and in others it is due to complications, such as endocarditis, pericarditis, myocarditis and in some cases hyperpyrexia.

Diagnosis is easy from the nature of the involuntary movements which are characteristic of the disease.

Treatment. The most essential consideration is rest, physical and mental. Absolute rest in bed for several days, freedom from irritation, and presence of companions who will be interesting and pleasant should be ensured. Light nutritious diet should be provided for. In severe cases the patient should be guarded against possible risks of injury and food given with care. Benger's Food, glucose, lactose and fruit juice should be given in plenty. The addition of alcohol is sometimes of great value. When the patient is improving, mild exercises of the muscles are desirable. Warm and tepid baths given regularly are always useful. As for drugs, salicylic acid or any of its preparations is useful; 10 to 15 grains may be given three or four times a day. Arsenic is also of value; 5 minims of liquor arsenicalis given three or four times a day. Antipyrin may be given in doses of 10 grains three times a day. The administration of hyoscine is sometimes useful to promote sleep. The bromides have little or no value as sedatives. In addition to the above, iron, glycerophosphates, hypophosphates, strychnine and cod-liver oil are of value.

Ordinarily, it is not desirable to interfere with pregnancy in this condition. In some cases, however, where the condition persists in spite of treatment or where jaundice, pyrexia or delirium sets in, it may be advisable to empty the uterus. The question of Cæsarean section may have to be considered when the disease occurs in the last weeks of pregnancy.

Deficiency Diseases

OSTEOMALACIA

This is a chronic disease occurring usually in females, characterised by decalcification and weakness of the bones, ultimately resulting in various forms of deformity and sometimes fracture.

Although osteomalacia is rare in most parts of the world, it would appear to be very frequent in certain endemic areas. In Europe, the disease is prevalent in the south of Italy, in the western districts of Switzerland, in certain portions of south Germany and Austria. It is a fairly common disease in northern India, parti-

cularly in the Kangra valley and all over Bengal, United Provinces, the Punjab and portions of Bombay. The disease is practically unknown in southern India, and in the few cases that have been observed by us the patients have been sojourners from northern India.

It is much more common in women and usually occurs between twenty and thirty years, although cases have been noted at a much earlier age. It is a deficiency disease due to lack of certain vitamins and occurring more commonly under poor hygienic surroundings with lack of sunlight. It is not confined to the poor, although it is naturally more frequent among such classes.

Causes. Among the causes that may predispose to this condition are deficiency of ovarian function, other varieties of endocrine insufficiency, infective causes as after a severe attack of puerperal fever, typhoid or scarlet fever, or morbid conditions of the thyroid and parathyroid glands. There is no doubt that pregnancy is the main predisposing factor in the majority of cases.

Symptoms. The onset may be insidious, so that the disease may not be recognised till it has reached an advanced stage. Pain, particularly referable to the bones in the pelvic region and back, and sometimes to the extremities, may be a prominent symptom. Tenderness over the affected bones may be present. Deformity of the spine or lower extremities may be observed and fracture of the bones from very trivial causes may be noted. In a woman who is pregnant, any symptom referable to the bones should always arouse the suspicion of osteomalacia. Pelvic deformity occurs early. There may be general weakness, associated with atrophy of the muscles. Symptoms of anæmia occur early, and tetany and fibrillary twitchings of the muscles may occur.

When the disease is more definitely established, there may be gastric or intestinal symptoms such as distension of the abdomen, indigestion and severe cramps. Occasionally fits may occur which may resemble hysterical fits.

When the disease has persisted for some time the patient is unable to walk, the pelvic and the long bones are very much deformed; severe pain may be present in the acute forms of the disease. When the disease has become chronic the pains are not severe, and by this time deformities of the spinal column such as lordosis or kyphosis may be present and the patient may assume a waddling gait. Soon, however, the patient is unable to move about and becomes hopelessly crippled. The commonest form of deformity of the pelvis resulting from osteomalacia is the *triradiate*

pelvis. This is particularly to be noted in view of the complications that it causes at the time of labour.

The extent of the deformity resulting from osteomalacia depends entirely upon the degree of softening of the pelvic bones. When the bones have become very soft, the pressure exerted upon the bones by the femora on either side and by the weight of the trunk compresses it to such an extent that the promontory is pushed downwards and forwards, while the femora push the lateral walls of the pelvis inward. It is from this cause that the superior strait of the pelvis presents a triradiate appearance. The pubic arch becomes very narrow the rami being pushed markedly forward, giving rise to the characteristic beak-like protuberance on the anterior wall of the pelvis. The size of the pelvic cavity is very much diminished.

Diagnosis. The condition may be diagnosed from the characteristic clinical history of the disease: its occurrence in the endemic area, the peculiar muscular palsies, the pains in the joints, the softening of the bones and various deformities. With each successive pregnancy the symptoms may become intensified. After delivery the pains generally disappear, and when the patient begins to move about she realises the nature of the deformities.

Treatment. Prophylactic. In all endemic areas pregnant women should be examined with care, and it is preferable to give them an abundant supply of vitamins, particularly vitamins A and D, in the shape of cod-liver oil. Exposure to sunlight is essential. Suitable diet, which will include plenty of fresh milk, and a sufficiency of proteins must be provided for.

Curative. When the disease is seen in its early stages, energetic treatment ought to be adopted. Sunlight, plenty of cod-liver oil and attention to the general hygienic condition is of importance. The diet should be liberal and comprise foods rich in calcium salts and phosphorus, such as milk, eggs, fish, sweet-bread and meat. Calcium salts, especially the glycerophosphates, may be given. Where softening of bones is noted, it is desirable to keep the patient at absolute rest in bed for a long period to avoid deformities.

Management of Labour. If proper treatment be adopted in the antenatal period, the difficulties may be considerably diminished when the patient goes into labour. If, however, the pelvis is badly deformed the abdominal method of delivery is the treatment of choice. In badly deformed pelvis the lower segment Caesarean section may not be possible, and it is better to resort to the classical section. Unfortunately cases do present themselves at a late stage of labour when the risks of the abdominal mode of delivery are very great. Forcible methods of delivery through the natural passages are to be deprecated. They cause such an extensive

trauma to the genital passages, with risk of sepsis and the ultimate sequelæ of vesico-vaginal and recto-vaginal fistulæ. The worst cases of fistulæ have been noted in cases of osteomalacic pelvis obstructing labour. It would appear to be far safer to perform a Cæsarean hysterectomy in the frankly infected cases.

Another method of treatment that may be adopted is the Porte's or Beyrout method with exteriorisation of the uterus.

When a definitely osteomalacic deformed woman again becomes pregnant the question of therapeutic abortion may have to be considered, since the continuance of the pregnancy may lead to a rapid aggravation of the disease.

The Infant. It is necessary to realise that the infants of osteomalacic mothers may show early signs of rickets. It is desirable in such cases to take suitable precautions by giving them sunlight exposures or ultra-violet ray therapy with cod-liver oil, etc. They should be carefully looked after, as in the majority of these cases artificial feeding is essential.

SPRUE

Sprue and sprue-like diarrhœas are fairly frequent in women during pregnancy and puerperium. Sprue is one of the tropical diseases which not infrequently occurs in various parts of India, China, Cochin China, Ceylon and some of the islands of the Malayan Archipelago. In a large number of cases the disease occurs in those who are ill-nourished and devitaminised. That it is a deficiency disease due to lack of certain vitamins is becoming more commonly recognised now. It gives rise to a type of anæmia which is megalocytic, sometimes hyperchromic, sometimes hypochromic. Whether the disease be due to a deficiency in the diet or to failure of absorption, it is more amenable to treatment on the basis of a deficiency disease.

When it occurs in pregnancy or during puerperium it results in a great deal of emaciation, asthenia and severe anæmia. At the height of the disease termination of pregnancy may sometimes occur. The tongue is often sore, the abdomen distended, intestinal flatulence present, and in neglected cases œdema of the feet, cramps, and tetany may supervene. Even with extreme forms of anæmia no neurological manifestations are present. In some cases a mild attack of sprue may become aggravated. The possibility of puerperal sepsis must be reckoned with in the devitalised, emaciated patients, with large and frequent stools.

The prognosis of this condition, which was at one time much graver, has fortunately improved with modern methods of treat-

ment. The essential factors in the treatment of this condition are:—

- (1) Dietetic restrictions to give the alimentary tract as much rest as possible.
- (2) The effective treatment of the megalocytic anæmia present; and
- (3) The supply of such deficiencies as may be demonstrated.

The patient should be put to bed for several weeks under proper hygienic surroundings and the diet should be bland and non-irritating. It is best to begin with milk, commencing with two to three pints a day, and gradually increase it to four or five pints. Tomato juice, fresh fruit juice and glucose may also be given. Later the food can be gradually increased so as to combine a fairly high proportion of protein with a low content of fat and carbohydrates.

So far as the anæmia is concerned, its treatment should be along the lines already discussed under anæmias of pregnancy, keeping a control by the estimation of the reticulocytes. Liver therapy is most effective. In the severe cases, intravenous or intramuscular injections of hepatax P.A.F. have certainly been of great value. Another preparation which has been found equally successful is campolon. Many other preparations are now available in the market for intramuscular injections. Marmite can also be given by mouth; but it is not so well tolerated. Blood transfusion, if attempted, should be done with the greatest caution and never should more than 100 c.c. of blood be transfused at a time. In the convalescent stage iron in large doses is necessary, 60 to 90 grains of the scale preparations being given per day, or ferrous carbonate (3-grain pills) three or four times a day. When the patient is able to take better nourishment, raw liver juice or lightly cooked liver may also be given. Along with this treatment any demonstrable deficiencies should be supplied. In cases of hypochlorhydria or achlorhydria, $\frac{1}{2}$ to 1. drachm of dilute hydrochloric acid in orange juice, before meals is indicated. If the blood calcium is low and there is a tendency for tetany, calcium lactate, 20 to 40 grains thrice daily, will be found useful.

For diarrhoea it is well to give drugs such as kaolin, tannalbin, pulvis creta aromaticus, or small doses of pulvis kino co., etc.

If labour starts in spite of precautions, it should be assisted in the most conservative manner—the second stage being shortened if necessary by the application of forceps. Particular care should be taken in all manipulations to avoid any possibility of sepsis.

During the puerperium efficient nursing is necessary to prevent infection.

Diseases of the Skin

ALBINISM

This is a congenital condition where there is complete absence of pigment in the skin and other epidermal structures. The hair is white, the eyes pink from the absence of pigment in the iris, and there is no pigmentation in the skin, even when exposed to the strongest sun's rays. Nystagmus is not infrequent in these cases, and the absence of pigment is possibly responsible for the inability of the patient to see the sun's rays or even ordinary daylight.

The importance of albinism as a complication of pregnancy rests on the fact that after termination of pregnancy, puerperal sepsis is not infrequent. In four cases that have been under our observation, in spite of the fact that every care was taken and labour was allowed to terminate naturally, puerperal sepsis of a mild or severe degree occurred in every one of them. In two the women died, while in the other two recovery occurred after a prolonged illness and convalescence. The exact cause for this infection was not evident. It is not unlikely that deficiency of certain endocrine factors, which perhaps are responsible for the condition of albinism, might have played their part in the causation of sepsis.

HYPO-VITAMINOSIS IN PREGNANCY

Deficiency of vitamins during pregnancy is attended with signs and symptoms which may lead to serious complications if neglected. Such deficiency is made manifest by gross evidences of malnutrition and the structures affected may be mucous membranes, skin, skeletal system, eyes, neurological and general. Deficiency of vitamin A leads to xerosis of the conjunctiva and cornea and central ophthalmoplegia. Deficiency of Vit. B may result in stomatitis, glossitis, hypochromic anaemia, polyneuritis and certain organic reaction psychosis. Rachitic deformities and osteomalacia are the result of vitamin D deficiency and defects in the calcium, phosphorus metabolism. Deficiency of Vit. C leads to scorbutic gums while hæmorrhagic manifestations results from Vit. K deficiency.

POLYNEURITIS

Neuritis in mild forms not infrequently manifests itself in pregnancy. Tingling, numbness and occasionally neuralgic pains may be noticed. Occasionally however the condition of Polyneuritis may develop more frequently in women who are

pregnant for the 1st or 2nd time. Progressive general weakness, usually of the lower extremities with atrophy of muscles may be noted. The extensors are usually more involved than the flexors. Occasionally hyperæsthesia of the skin, but more often tenderness on deep pressure is present. Large amounts of Vit. B₁ and B₂ concentrates together with cod liver oil and orange juice are indicated.

Surgical Emergencies during Pregnancy

The question, how far operative measures in pregnant women affect Pregnancy adversely, has been long discussed. The view commonly held is that it is not desirable that a pregnant woman should be operated on, because of the possibilities of interruption of pregnancy which adds risks to the mother and child. As a general rule, it may be said that if there is no urgency about the operation, it should be postponed till after the pregnancy terminates. On the other hand, improved technique and safer methods of anaesthesia have made surgery in the pregnant woman less risky than before. There are, however, certain emergency operations which cannot possibly be delayed. The occurrence of any acute abdominal crisis, such as appendicitis, a twisted ovarian cyst, acute intestinal obstruction, etc., necessitates immediate operation and should be undertaken irrespective of the period of pregnancy. Operations performed in the early months of pregnancy, in the first or second trimester, have certainly a much better prognosis. We have not infrequently operated on pregnant women during this period and removed an appendix, ovarian cysts, a twisted enlarged malarial spleen, and sub-peritoneal fibroids with no adverse effects. The average incidence of abortion, except when the uterus was intimately involved, was very small. In the later months of pregnancy, on the other hand, other difficulties arise which would make one hesitate to resort to operative measures, except when a definite diagnosis is made and the operation is inevitable. When an abdominal operation is indicated in the last weeks of pregnancy, the question should be considered whether it is necessary to deal with pregnancy at the same time.

Appendicitis. This is by no means an uncommon complication in the pregnant woman. Primary appendicitis is very rare, but recurrent attacks are by no means infrequent during the course of pregnancy. In cases of appendicitis occurring in pregnant women, it should be realised that perforation and suppurative peritonitis tend to occur in a much larger proportion of cases owing to the lack of any protective adhesions.

The prognosis of this condition is graver during pregnancy, but is more favourable if it occurs earlier in pregnancy than in the later months. Earlier in pregnancy, the favourable prognostic outlook is due to two factors. The condition is more easily and quickly recognised, and operative measures can be adopted without much difficulty, as at this period the pregnant uterus does not hinder the proper location of the appendix and its removal. When it occurs in the later weeks of pregnancy, or at the time of labour, the danger is greatest. Early diagnosis of this condition is of the greatest importance.

When a pregnant woman complains of pain in the right side of the abdomen, associated with an elevation of temperature and a tendency to vomit, with slight rigidity of the abdominal wall, the diagnosis of appendicitis is entirely justified, unless by a process of differential diagnosis it can be eliminated. Leucocytosis is usually present in varying grades.

Appendicitis may have to be differentiated from several other conditions which also cause abdominal pain, nausea and vomiting. Among such conditions are tubal gestation, acute salpingitis, twisted ovarian cyst, pyelitis, ureteral colic, intestinal obstruction, pernicious vomiting of pregnancy, a perforated gastric ulcer, biliary colic, diverticulitis, pancreatitis, etc. Although a very large number of conditions which give rise to an acute abdominal crisis have been enumerated, it is safest in the majority of cases where definite right-sided pain, tenderness, temperature and vomiting are noted, to presume that it is appendicitis and operate.

In the early weeks of pregnancy tubal gestation may simulate an attack of appendicitis; but the characteristic history, the findings at vaginal examination, the size of the uterus, and if necessary the exploration of the posterior cul-de-sac *per vaginam* by a hypodermic syringe will help to clarify the diagnosis.

Acute salpingitis undoubtedly simulates in some cases an appendicular colic. Leucocytosis and fever will be present, but very rarely nausea and vomiting. A history of painful micturition with burning sensation and vaginal discharge is suggestive, and a careful microscopic examination of a smear may reveal the presence of the gonococci.

Twisted ovarian cyst does give rise to an acute pain associated with collapse; but the pain is usually low in the abdomen, abrupt in its onset and associated with vomiting. There may be no elevation of temperature and a careful bimanual examination will reveal the presence of a cystic swelling in one or other fornix.

Pyelitis on the right side is a common complication of pregnancy, and it may often be very difficult to differentiate it from appendicitis.

most commonly between the fifth and seventh months among in primiparæ. It is frequently ushered in by a state associated with high rise of temperature and pain both in the abdomen and back. An examination of the urine may reveal the presence of pus cells and organisms. The rigidity is usually localized and may sometimes be absent, but repeated chills, high temperature and tenderness in the costovertebral angle suggest the possibilities of this condition.

Appendicular colic the onset is usually severe and abrupt, and if the patient is examined, presence of blood may be demonstrated microscopically and microscopically. The radiating nature of the pain is suggestive and a roentgenogram will be of considerable value in revealing the presence of stone.

Intestinal obstruction involving the small bowel may sometimes cause some difficulty in diagnosis. It should, however, be remembered that obstruction may be the result of the appendicular inflammation. The pain of intestinal obstruction is typical.

Excessive vomiting of pregnancy or hyperemesis occurs in the early months of pregnancy and is not associated with characteristic pain or elevation of temperature. It should present no difficulty in diagnosis.

Gastric ulcer is sometimes confusing: but the history of the case, the pain, rigidity and tenderness in a part of the abdomen will help in differentiating the

from **colic**, or the pain produced by cholecystitis, may be especially if the gall-bladder lies low. The pain, tenderness and rigidity are usually above the level of the umbilicus, and in some cases it may be possible to palpate the gall-bladder and the area of tenderness.

Sigmoiditis, especially if it be in the sigmoid, may be easily mistaken for appendicitis.

Whatever may be the nature of the condition, it should be remembered that in the majority of cases early operation offers the best chance of recovery. The pain of appendicular colic may be at varying places and may radiate differently, depending on the situation of the appendix and the direction in which it is

If there is a history of a previous attack of appendicitis in a woman, prompt surgical intervention is warranted. It is desirable to remove the appendix after any history of such an attack in a woman in the child-bearing period.

In the later weeks of pregnancy, the presence of the enlarged uterus makes it a little more difficult to expose the appendix

satisfactorily; and in some cases it may be necessary to empty the uterus before tackling the appendix. On the other hand, in the majority of cases there should be no difficulty to get at the appendix by suitably tilting the uterus to one side after opening the abdomen. The uterus should be manipulated as little as possible, and the sooner the operation is finished the better would be the prognosis.

So far as the termination of pregnancy is concerned, in the presence of suppuration in the appendix it is not desirable to empty the uterus; and in the majority of cases efficient drainage will prove sufficient.

CHAPTER XXI

DISEASES AND ABNORMALITIES OF THE OVUM

UNDER this heading will be considered the following abnormalities of the ovum:—

- (1) Diseases of the chorion.
- (2) Diseases of the amnion.
- (3) Diseases and anomalies of the placenta.
- (4) Diseases and anomalies of the umbilical cord.
- (5) Diseases of the foetus.
- (6) Anomalies in the development of the foetus.

Diseases of the Chorion

HYDATIDIFORM MOLE

Hydatidiform mole, otherwise known as vesicular mole, is due to the degeneration of the chorionic villi resulting in the death of the foetus and the conversion of the chorionic villi into a large number of vesicles varying in size from a small pea to a big-sized grape. They resemble hydatid cysts, and hence the name hydatidiform mole or vesicular mole.

Frequency. This condition is by no means rare. At the Government Hospital for Women and Children, Madras, there were 35 cases of hydatidiform mole among 20,420 cases of labour, giving a proportion of 1 in 583. It is more frequent in multiparæ than in primiparæ and generally occurs in the early part of pregnancy, between the eighth and twelfth weeks, rarely after the sixteenth week. In the majority of cases the foetus dies and no remnant of it can be found later, but a few cases are on record where a dead foetus has been found in association with a degenerated condition of the chorion.

Pathology. The chief changes are in the syncytium and the Langhans' layer of cells. There is extensive proliferation, and as a result, some of the columns of cells may penetrate deeply into the decidua, occasionally even through the muscular coat of the uterus. The proliferation is not confined to the epithelial cells, but extends to the connective tissue and to the vessels. The arteries of the degenerated villi become obliterated and disappear. Occasionally the mass is so intimately connected with the uterus that it cannot easily be separated; in some cases it takes on malignant activity.



FIG. 63.—Vesicular mole.

When the growth erodes through the large blood vessels a severe hæmorrhage occurs which sometimes proves fatal. The vesicles present a peculiar appearance resembling a bunch of grapes. The whole chorion may be converted into these cysts, or only a portion of the placenta may be so affected while the major part of it may be fairly healthy. This is likely to occur when the degeneration starts after the formation of the placenta. If the chorionic villi undergo degeneration before the placental formation the whole of the chorionic villi is generally involved in the morbid process. Where the degeneration occurs after the formation of the placenta, the foetus may survive and occasionally go to full term, and only after delivery may the presence of this abnormality be revealed by an examination of the placenta.

Another fact sometimes noted is that the ovaries undergo a peculiar form of polycystic degeneration. These cysts are generally lutein cysts; it is not known what conditions favour the formation of lutein cysts as they are not invariably present in all cases of hydatidiform mole.

Signs and Symptoms. In the early weeks, there may be nothing to call attention to the fact that a degenerative process has started, but with the gradual advancement of the pregnancy three important signs appear which are characteristic of this peculiar condition.

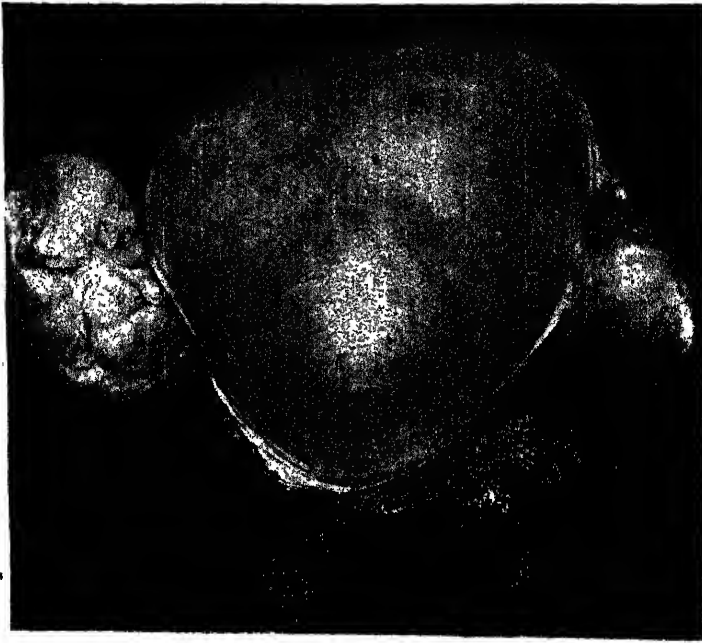


FIG. 64.—Uterus with a vesicular mole showing also lutein cysts of the ovaries.

(1) The enlargement of the uterus is out of all proportion to the period of amenorrhœa; thus, with a woman giving a history of ten to twelve weeks of amenorrhœa, the height of the enlarged uterus on palpation may be found to be midway between the umbilicus and the symphysis, or even as high as the umbilicus.

(2) Vaginal hæmorrhage occurs at intervals in an irregular manner, sometimes profuse, sometimes scanty. But more important than the hæmorrhage is the serosanguineous discharge which persists for some time. If the discharge be carefully examined the presence of small vesicles may be detected, or a small piece of

tissue may be passed, with some vesicles, which appears like a red currant jelly with white currants interspersed in it.

(3) On palpation the uterus has a doughy feel and foetal parts cannot be made out. Auscultation does not reveal the presence of the foetal heart sounds.

Reflex symptoms that may occur in this condition are excessive nausea, vomiting, faintness, occasional attacks of syncope and vague abdominal discomfort. In a minority of cases albuminuria may be present; in some cases, the vesicular mole takes on a malignant activity and infiltrates through the uterine wall into the peritoneum. A uterus harbouring a mole may occasionally be of normal size or even smaller than the period of amenorrhœa would indicate. Lutein cysts of the ovaries, so frequently associated with Hydatidiform mole, are the result of constant bombardment of the ovary with chorionic gonadotropic hormone. The fluid content of these cysts, like all other fluids of the body including the spinal fluid, contains large quantities of chorionic gonadotropic hormone. Following complete removal of the mole, biological pregnancy tests will be positive until the gonadotropic hormone stored in the cyst fluid has been exhausted. This is true even in the absence of chorion-epithelioma.

Signs of Toxæmia, particularly nausea and vomiting, constitute an important clue to the presence of Hydatidiform mole. Therefore when a woman in the third to fifth month of pregnancy has uterine bleeding and cramps, nausea, vomiting, cedema or albuminuria or other signs of toxæmia, one must think of mole and do the biologic tests (urine, blood and spinal fluid). Toxæmia without a mole rarely occurs in the early months of pregnancy.

In general, the hormone level will return to normal within three months following termination of a hydatidiform mole, but an abnormal level that persists for a longer time does not necessarily indicate presence of chorion-epithelioma, provided the level does not rise during this time. A follow-up for twelve months after the first negative hormone test obtained after a Hydatidiform mole is necessary for proof that malignant change has not occurred.

Diagnosis. The presence of the cysts can sometimes be made out by vaginal examination. The passage of the cysts *per vaginam* is pathognomonic of this condition. The main points in the diagnosis are the excessive size of the uterus, the absence of any definite foetal parts and of the foetal heart, the doughy feel of the uterus, together with the history of irregular bleeding or serosanguineous discharge *per vaginam* and the passage of the characteristic vesicles.

A roentgenogram is helpful in demonstrating the foetal parts.

In cases of doubt, an Aschheim-Zondek or Friedman throw considerable light, as the test is always positive rather than in normal pregnancy. In those rare cases, however, the vesicular mole is blasted and has ceased to grow, the test may be negative. If bilateral lutein cysts can be palpated on examination it will aid in the diagnosis. Where metastases have occurred, as in the vagina, not only may the diagnosis of vesicular mole be made out, but the possibility of its having a malignant character may also be inferred. The uterus is not always as big as normal in a vesicular mole, for in conditions where the mole has ceased to grow retrogression may take place, resulting in the gradual shrinkage of the uterus so that a stage may be reached when it may not be disproportionate to the period of amenorrhœa, or in extreme cases it may even be smaller than the period of amenorrhœa would suggest.

A rare mistake that may occasionally be made is to confuse this condition with placenta prævia or accidental hæmorrhage.

Occasionally the condition may be mistaken for haematometra. This is more likely to occur in those cases where the decidua resulting from the hydatidiform mole is retained in the uterus. Even so the uterus is not tense or cystic, and a vaginal examination will reveal the absence of a tense bag of membranes. It is difficult to distinguish between concealed accidental hæmorrhage with a normal pregnancy and concealed hæmorrhage in a case of vesicular mole. The diagnosis may be clear when an attempt is made to rupture the membranes, when it will be found that while in a normal pregnancy with concealed hæmorrhage the membranes may be ruptured, in no possibility of rupturing the membranes in vesicular mole associated with concealed hæmorrhage.

Prognosis. The prognosis of this condition is determined by account of the many risks to which the patient is liable. Some of these are hæmorrhage, sepsis, perforation of the uterus, and development of a malignant tumour later. The more advanced the period of pregnancy the graver is the prognosis, as hæmorrhage in such cases is more severe. Continual loss of blood render the patient so anæmic that she may not be able to undergo evacuation of the uterus; the general health of the patient is considerably vitiated by the other complications such as vomiting, presence of albuminuria, etc. If the patient is observed early after the onset of symptoms and the

evacuated with care, and the patient is kept under continuous observation for a period extending to two years, the prognosis may not be unfavourable.

Treatment. Once the diagnosis of hydatidiform mole has been made, the only proper treatment is to empty the uterus as early as possible. Delay in resorting to this step may sometimes lead to disaster, as the patient may have a sudden attack of severe bleeding which may so lower her vitality that the further steps necessary for completing the evacuation of the uterus may be hazardous. In some cases the patient may come with bleeding, the os sufficiently dilated and a portion of the vesicular contents projecting or partially expelled. In such cases, a hot vaginal, douche should be given. Under anaesthesia, the os should be dilated to allow at least two fingers to be introduced and the whole of the vesicular contents separated from the uterine wall, and then by bimanual compression of the uterus the mole should be expressed. The patient should be given an injection of pituitary extract and ergometrin and the collapse if any treated on usual lines.

We do not advocate the use of the metal curette in this condition, as the only curette that is satisfactory and safe is the finger. The chances of perforation of the uterus with an ordinary curette are so great and the possibilities of removing the vesicular contents completely are so remote, that it should never be done.

A hot intra-uterine douche may in some cases be given after evacuation to allow the remnants of the vesicular contents being washed out.

When, however, the patient comes with a certain amount of hæmorrhage and the cervix is closed, the more satisfactory method of evacuation is by abdominal or vaginal hysterotomy. If there is no evidence of sepsis we prefer the abdominal route for the following reasons: the uterus can be opened into and satisfactorily evacuated; the condition of the uterine musculature and of the endometrium can be examined thoroughly to find out if there has been any attempt at invasion of these structures by the vesicles. If there is any suspicion that invasion has occurred, it is better to perform a hysterectomy for fear that malignant changes may take place later.

It is our experience that where the cysts are very small the chances of invasion of the uterine wall are greater, and hence the possibility of malignancy is more than in cases where the cysts are large, grape-like and are easily separable from the uterus. One should not hesitate, if there is considerable amount of difficulty in

separation of the vesicular contents owing to the close attachment of the vesicles to the muscular wall, to resort to hysterectomy in such cases. The disadvantage is that the uterus is sacrificed and another chance of conception is rendered impossible. An alternative suggestion for this will be given later.

The vaginal route method of hysterotomy is to be preferred if there is any chance of a septic infection. Whatever the method of evacuation adopted, where the uterus is left *in situ*, the patient should be cautioned to seek immediate assistance if there is a recurrence of hæmorrhage, and certainly to come in for examination six to eight weeks after evacuation. In some cases bleeding recurs a week or so later owing to the incomplete evacuation of the uterus. In such cases a secondary curettage may be necessary, and then one may be justified in using the large blunt flushing curette to ensure complete evacuation. At the periodical examinations after evacuation of a hydatid mole the Aschheim-Zondek test should be done to see if it is positive. Frequently one can state from this test that a case is going on to the stage of chorion-epithelioma; so this most helpful method of settling a grave issue should never be lost sight of. A positive result means the presence of living chorionic tissue.

In cases where the uterus has to be conserved and there is suspicion of a commencing malignant degeneration, a method of treatment that can sometimes be adopted is to give radium therapy six to eight weeks later (30 mgms. of radium introduced into the uterine cavity for twenty-four hours). As has been already stated, patients who have had vesicular mole removed must be carefully watched for a period extending to two years; and on the appearance of any symptoms or signs suggestive of chorion-epithelioma, suitable methods of treatment should be adopted which will be detailed later. The general health of the patient should be attended to and tonics, particularly hæmatinics, should be administered. It is wise for the patient not to risk pregnancy for some years after a vesicular mole has been passed.

In some cases where facilities are not available for performing hysterotomy, or the general condition of the patient is not satisfactory to stand such an operation, a method of treatment that has been adopted when the cervix is not sufficiently dilated is as follows: the cervix is dilated by a few metallic dilators, the vesicular contents are stirred up, the cervical canal and the vagina tightly plugged and the patient given 1 c.c. of pituitary extract and kept at rest. The pituitary extract is repeated at intervals of four to six hours, and it will be found after an interval of twelve to

sixteen hours when the plugs are removed that cervical dilatation has progressed and that the vesicular mole is practically separated; the uterus is easily evacuated by the fingers passed through the dilated cervical canal and a hot intra-uterine douche given thereafter. This method of evacuation at two stages where the cervix will not permit of evacuation at once helps to save the patient from the severe risks of hæmorrhage or lacerations of the cervix.

The bilateral lutein cysts which have been referred to, generally shrink after evacuation of the uterus, and in those cases where an abdominal hysterotomy is performed it is unnecessary to remove them.

CHORION-EPITHELIOMA

This is a form of new growth met with in the uterus. It occurs after a pregnancy and is followed by metastasis in other organs. The pregnancy may have ended in abortion or full-time labour, but in the majority of cases chorion-epithelioma results after a hydatidiform mole. In some cases the malignancy may occur with the development of hydatidiform mole. More frequently the malignant degeneration starts a few weeks after the expulsion of the vesicular mole. Cases have been recorded where chorion-epithelioma has developed in the Fallopian tube.

Pathology. The tumour is generally in the uterine wall, and it is soft, intensely hæmorrhagic and variegated in colour. Metastasis occurs rapidly, particularly in the lungs, brain and the vagina. On microscopical examination the tumour is found to be made up almost entirely of broad, irregular and ragged anastomosing strands of the two types of cells of chorionic epithelium—the one consisting of the Langhans' cells, smaller and more regular in form, with pale or almost clear protoplasm; the other of the syncytial cells staining more deeply, in which numerous nuclei, often of large size, are embedded in masses of protoplasm.

There are some features which are peculiar about these tumours. Even under normal conditions the chorionic epithelium tends to invade, while in the condition known as hydatidiform mole there is an exaggeration of the development of the villi; in chorion-epitheliomata these changes take on increased activity. Another peculiarity is that chorion-epitheliomata sometimes seem to retrogress and disappear completely. The presence of the lutein cysts in the ovary has given rise to the hypothesis that if there is a great overgrowth and excessive activity of the corpus luteum tissue it may produce excessive growth of the chorionic villi, over which its secretion is supposed to have an effective control. On

the other hand, it has been suggested that the excessive growth of the chorion requires the development of the additional corpus luteum tissue. It is by no means settled what is the cause and what the effect.

Symptoms. Chorion-epithelioma may occur in individuals from 17 to 49. It is more common in multigravidæ than in primigravidæ. It may occur after full term labour but it is more common after abortion and especially after molar expulsion. Symptoms indicative of chorion-epithelioma may appear from the day after termination of pregnancy to three years thereafter. Repeated uterine hæmorrhage following a hydatidiform mole, abortion, or full-time labour particularly if persisting, should always arouse the suspicion of a chorion-epithelioma. The bleeding may be due to remnants of the mole being left behind, or to a piece of placenta, or to a placental polypus. In these conditions, however, simple curettage will generally cure the condition; whereas, in cases of chorion-epithelioma, the bleeding is not controlled and may become worse. Examination of the uterine scrapings microscopically will reveal the presence of malignancy. The patient is generally anæmic and complains of pain in the lower part of the abdomen. Where secondary deposits have occurred other symptoms may follow. Secondary deposits in the lungs generally give rise to pulmonary symptoms such as pain in the chest, a persistent cough and a blood stained sputum.

On bimanual examination the enlarged uterus, distended by the tumour, may be felt. In some cases, where the growths have spread to the vagina, they may be easily made out and they will be found to bleed readily on examination.

Prognosis. The prognosis is grave, but if the patient is subjected to treatment at an early stage it is very much improved. Death may result from hæmorrhage, cachexia, secondary infection, perforation of the uterus with peritonitis, or secondary metastasis affecting the lungs, liver, brain, etc.

Diagnosis. Repeated hæmorrhages after abortion or full-time delivery should be looked upon with considerable suspicion. If curettage does not control the hæmorrhage, or if the microscopical examination of the scrapings reveals the presence of the malignant growth, the diagnosis is obvious. Vaginal metastasis may also help in the diagnosis.

The Aschheim-Zondek test is of considerable importance, as in these conditions it persists for a long time and can be obtained even with high dilutions of the urine, thus demonstrating the presence of very large quantities of the anterior pituitary-like

hormone in the urine. If the Aschheim-Zondek test has been negative for some time after the expulsion of the vesicular mole and again becomes positive, in the absence of any signs of pregnancy the diagnosis of a chorion-epithelioma is absolute.

Treatment. In all cases where the condition is operable, a complete removal of the uterus and its appendages, together with such metastatic growths as can be removed is the best. Where metastatic growths are present in the lungs or in other structures, not within reach of operative technique, deep X-ray therapy is of great value. Removal of the primary chorion-epithelioma does not bring about re-absorption of its metastasis. Negative X-ray findings of chorion-epithelioma in lungs, in the presence of lung symptoms do not necessarily indicate absence of metastasis unless proved otherwise or unless the negative findings persist four to five weeks after first examination. Surgical removal of the tumour in accessible places and early X-ray treatment of the lungs, should they be affected by metastasis, give the highest percentage of recovery.

An alternative method of treatment which is being tried with satisfactory results in early cases is the use of radium and deep X-ray for this condition. Fifty mgms. of radium may be applied for forty-eight hours, repeated if necessary after an interval of two or three weeks. The patient should be continuously under observation after this method of treatment for at least a year. Deep X-ray therapy should supplement the use of radium under these circumstances.

Diseases of the Amnion

HYDRAMNIOS

By this term is meant the condition where there is an excessive quantity of liquor amnii present in the gravid uterus. The normal amount of liquor amnii present ranges between 2 to 5 pints. Anything in excess of this constitutes hydramnios. There may be considerable variations in the quantity of liquor amnii present in a case of hydramnios and as much as 40 to 50 pints have been met with.

Ætiology. The ætiology of this condition is still obscure. The excess of liquor amnii may be derived from several sources. It may be from the amniotic membrane itself, or it may be from the foetus, or the mother. Hydramnios is not infrequently associated with plural births or foetal abnormalities. Anencephaly, spina bifida, and several other deformities of the foetus such as

talipes, ectopia vesicæ, congenital cystic kidneys, etc., are found. In some cases the condition may be the result of some obstruction in the foetal circulation, either in the umbilical cord or within the foetus. A factor which may have some bearing is the possibility of an excessive urinary secretion resulting from some damage to the kidneys or the heart of the foetus.

Diseased conditions of the mother involving secondary disturbances may lead to a diseased condition of the placenta with increased transudation into the amniotic cavity. Thus, in cardiac and renal affections œdema of the placenta may occur and a greater amount of fluid may pass into the amniotic cavity.

Syphilis may be responsible in some cases, particularly when the viscera are affected.

Symptoms. There are two types of hydramnios, chronic and acute.

The symptoms of chronic hydramnios are largely those produced by mechanical factors as a result of the increased pressure exerted by the over-distended uterus upon the adjacent viscera and structures in the abdomen. Thus the pressure effects may be felt

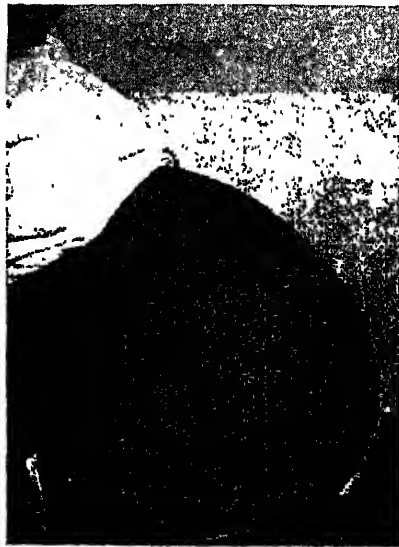


FIG. 65.—Hydramnios.

by the lungs, the heart, kidneys, intestines, bladder, nerves and veins. In consequence thereof, the patient may complain of respiratory embarrassment due to pressure upon the diaphragm and the lungs. Attacks of precordial pain, palpitation, cyanosis and dyspnoea may result from pressure upon the heart in association with pressure upon the lungs. Pressure on the kidneys may result in diminution in the quantity of urine passed; pressure on the stomach and intestines may result in indigestion and constipation; pressure on the veins may cause œdema of the extremities; pressure on the nerves may give rise to pain in the lower extremities and neuralgia. Even with a fairly large quantity of liquor amnii the condition, if it is chronic, does not in many cases give rise to any severe symptoms of distress.

On the other hand, in acute cases the symptoms of distress are more in evidence, obviously due to the fact that the patient

has not been able to adjust herself to the sudden and severe distension. Apart from the mechanical effects of pressure, acute hydramnios may give rise to a certain amount of shock and also cause severe pain from the sudden stretching of the uterine musculature and its peritoneal investment.

Hydramnios can occur at any time during pregnancy. If prolonged it may lead to emaciation, slight elevation of temperature, nausea and vomiting and signs suggestive of toxæmia.

Acute hydramnios usually occurs about the fifth or sixth month of gestation, and may in some cases lead to premature termination of pregnancy.

Diagnosis. The enlargement of the uterus, which is out of proportion to the period of pregnancy, the tense cystic condition of the uterus on palpation, together with a fluid thrill and occasionally the easy ballottement of the foetus, will indicate the diagnosis.

Hydramnios has to be differentiated from:—

- (a) Multiple pregnancy.
- (b) Ovarian cyst complicating pregnancy.
- (c) Ascites.
- (d) Concealed accidental hæmorrhage.

The differential diagnosis is easy provided a careful examination is made.

In multiple pregnancy the uterus is never tense and numerous small parts of the foetus are easily palpable, except in those cases where multiple pregnancy exists in association with hydramnios. Their differentiation without the aid of X-rays is practically impossible, and it can only be surmised that in addition to the hydramnios multiple pregnancy may also be present. The foetal heart is not easily audible in cases of hydramnios; but in uncomplicated cases of multiple pregnancy the foetal heart is distinctly heard—indeed two can sometimes be detected—foetal parts are easily felt and the uterus itself is lax.

Ovarian cysts may give rise to a great deal of abdominal enlargement if associated with pregnancy. A careful examination will reveal the presence of foetal parts and the cystic tumour separate from the uterus. An X-ray examination is of considerable value in some cases.

In cases of pregnancy complicated with ascites, characteristic shifting dullness may be demonstrated. A bimanual examination will reveal that the uterus itself is not involved and that there is no undue tenseness of the fluid within its cavity.

Concealed accidental hæmorrhage may sometimes be mistaken for acute hydramnios. In both cases there is a sudden acute distension of the uterus, associated with more or less severe pain and signs of shock. But in concealed accidental hæmorrhage the secondary signs of hæmorrhage are manifest, whereas in cases of acute hydramnios no signs of hæmorrhagic collapse will be present. Moreover, signs of a more or less severe toxæmia of pregnancy are often present in cases of concealed accidental hæmorrhage, but in cases of acute hydramnios they are generally absent or only slightly marked.

Complications. Complications in a case of hydramnios may occur either during pregnancy or at the different stages of labour.

During Pregnancy. As a result of pressure effects, dyspnœa, cyanosis, precordial pain, palpitation of the heart, œdema and neuritis may necessitate an early termination of pregnancy.

During Labour—First Stage. Weak uterine contractions—primary uterine inertia. Premature rupture of the membranes. Presentation of the cord. Malpresentations and malpositions.

Second Stage. Prolonged labour. Uterine inertia. Prolapse of the cord. Ablatio-placentæ.

Third Stage. Retained placenta. Postpartum hæmorrhage.

Prognosis. It will thus be seen that the prognosis in cases of hydramnios is unfavourable both for the mother and the child. To the mother the risks incidental to excessive pressure, the complications in the three stages of labour, particularly those which may result from malpresentations and postpartum hæmorrhage add to the dangers.

So far as the foetus is concerned, apart from the possibility of abnormalities and deformities, malpresentations, prolapse of the cord, prolonged labour, weak uterine contractions and the necessity for interference, together with the fact that labour is often premature, make the foetal prognosis very unfavourable.

Treatment. Minor grades of hydramnios may not require any treatment, and it is not infrequent that in such cases labour comes on prematurely and terminates spontaneously without undue risks to mother or foetus. The general health of the patient must be attended to, the bowels must be kept regular, the patient rested, and every care taken to see that the kidneys function properly. On the other hand, in the severe forms of hydramnios, where the uterus is much distended and respiratory or cardiac distress is present, pregnancy may have to be terminated, irrespective of the period of gestation.

Where pregnancy is to be terminated on account of the distressing symptoms caused by excessive pressure, rupture of the membranes is the method to be employed. If the woman is in labour it is desirable to rupture the membranes artificially, because if the tense bag of membranes be allowed to dilate the cervix, rupture will take place prematurely, but at the most dependent part of the bag of membranes, and result in the escape of a large quantity of liquor amnii. Such a large gush of water escaping suddenly may lead to one or more of the following complications :—

- (1) The cord may be washed out in front of the presenting part with the first gush of the fluid.
- (2) The force with which the fluid escapes may promote a malpresentation or malposition or prolapse of a limb.
- (3) The sudden relief of tension may produce a negative pressure, which favours separation of the placenta and thus causes accidental hæmorrhage.
- (4) The sudden relief of tension may also give rise to a degree of shock.

For these reasons when the patient is in labour it is better to rupture the membranes artificially sufficiently high up, so as to allow the fluid to drain off under control and to see that only a limited amount of liquor amnii escapes. When the cervix is dilated to admit one finger this is done by carefully passing a male metal catheter between the membranes and the uterine wall as high up as possible, but not so as to impinge upon the placenta. Then by sharply tapping the amniotic sac as much of the fluid is allowed to escape through the catheter as is necessary for the relief of tension. When the membranes are ruptured high up in this manner the bag of membranes is still preserved; a sufficiency of liquor amnii is left behind in the uterus; no sudden emptying of the uterus occurs, and while a certain amount of liquor amnii may continue to escape through the valvular opening thus made, as more frequent uterine contractions develop, a uniform dilatation of the cervix is possible with a natural course of delivery.

Another great advantage is that the chances of postpartum hæmorrhage are reduced, because the uterine musculature has had time to regain its tonus. Postpartum hæmorrhage is much more likely to occur in those cases where the uterus empties itself suddenly, as sometimes occurs with a premature foetus soon after rupture of the membranes.

Where labour is induced on account of pressure symptoms, a similar method of induction may be adopted, namely, high rupture of the membranes by passing a catheter.

A method that has recently come into vogue and has been successfully adopted is, tapping the fluid through the abdominal wall. This has supplanted the old method of rupturing the membranes high up. It has the advantage that gradual drainage and relief of tension are favoured. Labour sets in within a reasonable interval and generally terminates by natural powers without any complications. The following case illustrates the point:—

A sixth para was admitted with severe pressure symptoms due to chronic hydramnios of some weeks' duration. The abdomen was very much distended, and as the patient was suffering from severe respiratory embarrassment it was decided to tap the amniotic sac through the abdominal wall by passing a trocar and cannula. After taking the usual precautions to avoid the bladder and the placental site a small sized trocar was passed with strict aseptic precautions through the abdominal wall into the uterine cavity; 16 pints of amniotic fluid were allowed to drain off, the trocar was removed and the puncture sealed with collodion. The patient was immediately relieved of much of the respiratory embarrassment. Thirty-six hours later uterine contractions started and six hours after commencement of the pains the cervix was fully dilated, a fair-sized bag of membranes was present, which on rupture was followed by the birth of a premature live foetus weighing 4 lbs. The third stage was uncomplicated and the convalescence was uneventful.

In every case of hydramnios precautions must be taken to treat the condition of postpartum hæmorrhage should it supervene. For this reason special care must be taken in any operative method of delivery. It is much safer to allow labour to terminate spontaneously and to avoid using an anæsthetic.

OLIGOHYDRAMNIOS

Oligohydramnios, otherwise known as oligamnios, is a condition associated with a decrease in the amount of liquor amnii and is somewhat rare. The total amount of liquor amnii may be only a few ounces. The result of this diminution in the quantity of liquor amnii is to permit of adhesions developing between the membranes and the foetus. Deformities of the foetus such as encephalocele, anencephalus, club-foot, drop-wrist, amputation of the extremities or fingers, ankylosis of joints, etc., are common. Some of these defects are due to the cramped space in which the foetus has to develop; others are due to amniotic adhesions encircling a part of the foetus and thus compressing it.

The ætiology of this condition is not known.

When labour begins the uterine contractions may be painful and weak and the first stage is thus protracted. The placenta may

sometimes be prematurely separated. Labour is not infrequently premature and may have to be terminated by artificial assistance. Owing to deficiency of liquor amnii the foetus may show signs of distress even before rupture of membranes.

Anomalies and Diseases of the Placenta

Anomalies of the placenta may be of size, form, number, relationship and position.

ANOMALIES IN SIZE

The normal weight of the placenta is about 1 lb. and the ratio of the weight of placenta to the foetus is as 1:6. In some cases the placenta is very much smaller and this may lead to arrest in the development of the foetus. In other cases the placenta may be hypertrophied, occasionally the weight being as much as 2 lbs. Under such circumstances there is a tendency for the foetus to be much larger. A relative increase in the weight of the placenta may occur in certain diseased conditions such as syphilis, albuminuria and diabetes.

Placenta Membranacea. In this condition the placenta extends over the greater portion or even the whole of the chorionic surface, and the increase in area results in the formation of a thin and membranaceous placenta. As a result of this larger placenta covering a greater surface area of the uterine cavity the placenta tends to become *prævia*, which gives rise to antepartum hæmorrhage. There is a tendency in the third stage of labour for the placenta to be retained or even adherent, and this causes postpartum hæmorrhage. This is fortunately a rare form of abnormality, but when it does occur, manual removal of the placenta may be necessary.

ANOMALIES IN FORM

Among these may be mentioned:—

(1) **Lobate Placenta** (or multiple placenta in single pregnancy). In this condition the placenta is divided into two or more lobes, and in some cases as many as seven lobes have been noted. Depending upon the number of lobes the placenta is known as bipartite, tripartite, etc.

In this condition there is a single cord attached to the placenta which divides into its constituent elements, and the vessels from each one of these lobes finally unite to form the umbilical vessels.

(2) **Placenta Fenestrata.** This condition is characterised by one or more solutions of continuity in the substance of the placenta, through which the chorion is visible,

(3) **Horse-shoe Placenta.** Occasionally the placenta is kidney-shaped, when it is known as a horse-shoe placenta.

In all these anomalies difficulty may arise in the third stage of labour through partial detachment of the placenta and consequent postpartum hæmorrhage.

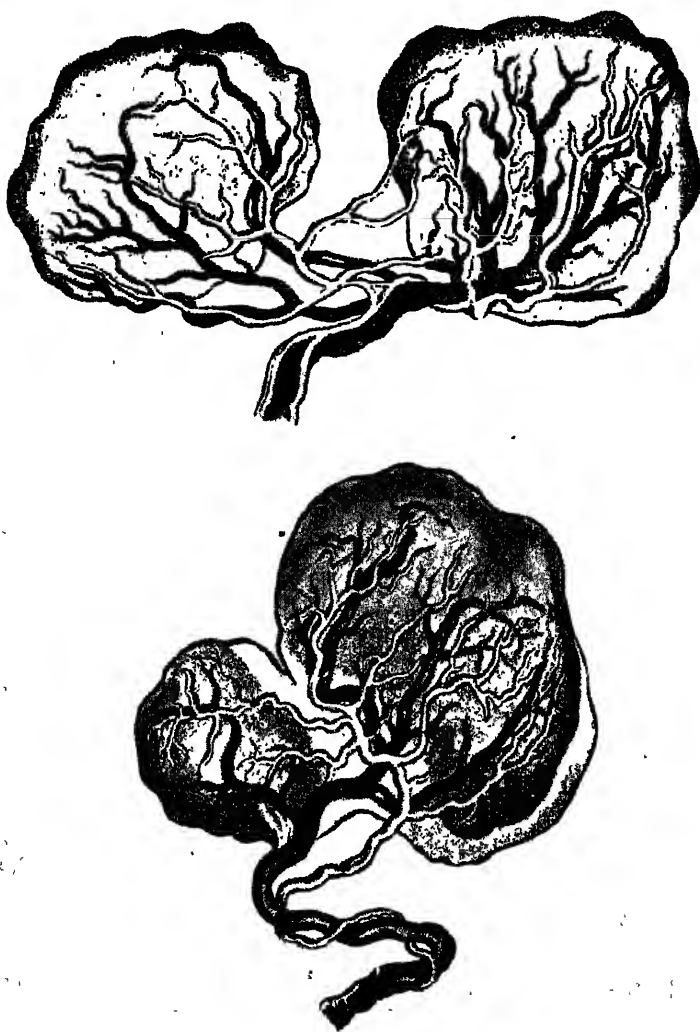


FIG. 66.—Placenta bipartite.

ANOMALIES IN NUMBERS

Sometimes there are supernumerary or accessory placentæ. The commonest form of this anomaly is that known as **placenta succenturiata**. As many as half a dozen of these succenturiate lobes may be found within a single uterus,

In the third stage of labour the succenturiate lobe may be retained within the uterus, causing postpartum hæmorrhage either primary or secondary. Sapræmia may also result, and later the succenturiate lobe may give rise to the formation of a placental polypus, causing severe and prolonged hæmorrhage. The condition should be looked for and a careful examination of the placenta and membranes after they have been expelled will always help in diagnosing it. Where a succenturiate lobe is retained within the uterus, an examination of the membranes will reveal a small round area of deficiency a short distance from the placental margin,

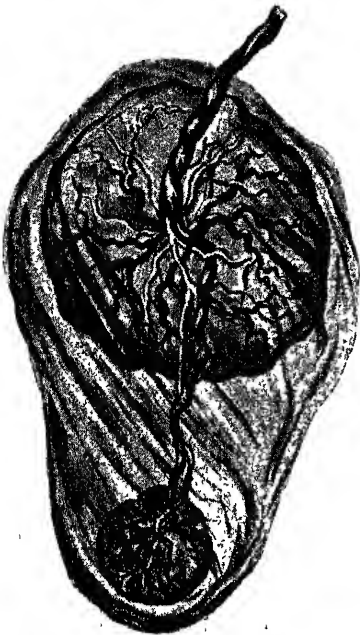


FIG. 67.—Placenta succenturiata.



FIG. 68.—"Battledore" placenta.

and if it is also noted that torn vessels are present extending from the placenta to the margin of the tear in the membranes the diagnosis becomes certain.

ANOMALIES OF RELATIONSHIP

In this condition there are anomalies of relationship between the placenta and the membranes or the cord. Among the varieties that may be met with are:—

(a) **"Battledore" Placenta.** This term is applied to a placenta in which the cord is attached to the margin of the placenta.

(b) **Placenta Marginata or Placenta Circumvallata.** Here the chorion is attached, not at the border of the placenta but within

the placenta itself, a little distance from its margin, so that a portion of the placenta is present beyond the attachment of the membranes.

The clinical significance of these placental anomalies is twofold :—

(1) The amnion and chorion may be found intimately adherent, so that when the after-birth is expelled, portions of the membrane may be left behind.

(2) Incomplete detachment, retention of the placenta and atonic postpartum hæmorrhage are frequently encountered.

ANOMALIES OF POSITION

Placenta Prævia. We have referred to this condition in the chapter on antepartum hæmorrhages. The normal position of the placenta is more or less fundal. When the placenta is wholly or partially situated in the lower uterine segment the condition is known as *placenta prævia*.

Diseases of the Placenta

Various diseased conditions may be noted in the placenta, in some of which the nature and extent of the disease may unfavourably affect the foetus. Chief among these diseased conditions are :—

(1) **Infarct Formation.** This is the most frequent abnormality of the placenta and is generally found in conditions associated with increased arterial tension or venous congestion, for example, in chronic nephritis and the toxæmias of pregnancy. Cardiac disease and syphilis are also factors which may cause placental infarction.

There are no clinical symptoms characteristic of this condition. If it occurs in the first half of pregnancy abortion is likely to result.

(2) **Placentitis.** Inflammation of the placenta may occur, although somewhat rarely. It may be either acute or chronic. The inflammation is generally not a primary condition, but may be due to extension of infection from the decidua due to an exacerbation of a pre-existing disease, for example, chronic gonorrhoea or any infective process of a pyogenic nature. In some specific infectious diseases also, inflammation of the placenta may occur. Placentitis may sometimes be set up as a result of albuminuria, particularly if other factors are also present.

Two diseases which may affect the placenta are tuberculosis and syphilis. In tubercular infection of the placenta, caseating tubercles may be scattered chiefly in the decidua and rarely in

the villi. This is extremely rare, and it would appear as though the placenta is almost immune to Koch's bacillus.

Syphilis is by no means infrequent and is the commonest cause of foetal death. The syphilitic placenta is usually large, thick and lighter in colour than normal. Its weight is proportionately increased and may be one-third to one-fourth the weight of the foetus. It is impossible to make any accurate diagnosis of syphilitic placentitis during pregnancy. Besides the risks to the foetus the maternal risks are due to the presence of adherent placenta and subsequent possibilities of sepsis. With the modern methods of antisyphilitic treatment, the prognosis is considerably better if the condition is treated in time.

Among other degenerative changes in the placenta may be mentioned cystic degeneration, calcareous degeneration, fatty degeneration and occasionally hyaline degeneration. In calcareous degeneration there may be small calcareous nodules on the maternal surface of the placenta, and occasionally they may be so abundant as to give the sensation of feeling a coarse sand-paper when the finger is passed over the area.

Placenta Accreta or Increta. This is a very rare form of adherent placenta and is the result of imperfect development of the decidua or excessive proliferation of the chorionic epithelium, so that the villi invade the underlying musculature and even occasionally perforate through the uterus, reaching the peritoneal surface. There is no line of cleavage between the musculature of the uterus and the placental tissue and their separation is impossible, either naturally or artificially. The condition has been referred to in detail under postpartum hæmorrhage.

Anomalies of the Umbilical Cord

(1) **Length.** The normal length of the umbilical cord is about 20 to 22 ins.; but great variations may occur. It may be very short or abnormally long. Variations between 5 and 40 ins. have been observed. In one case within our experience there was no umbilical cord, the placenta being directly attached to the surface of the liver in a case of exomphalos. *Short cord* may give rise to dystocia for two reasons: it may arrest the descent of the foetus and it may, by pulling on the placental site, cause reflex inhibition of uterine contractions. Occasionally it may lead to premature separation of the placenta or favour inversion of the uterus.

An unduly *long cord* may give rise to the following complications:—

(1) Presentation and prolapse of the

- (2) Knots and twists of the cord.
- (3) Cord round the neck or the body several times

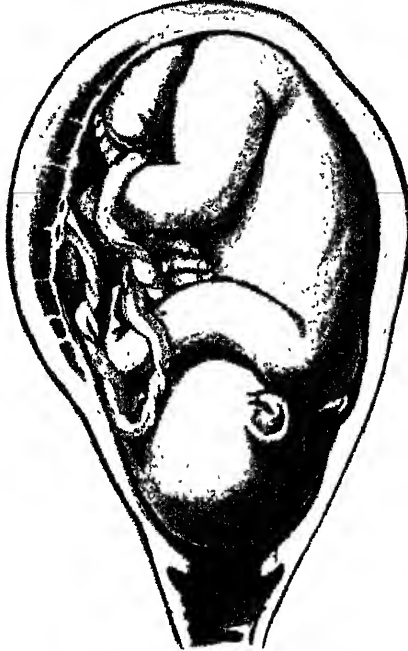


FIG. 69.—Cord round the neck.

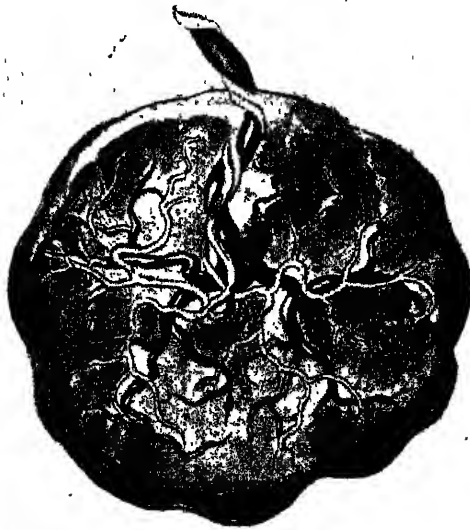


FIG. 70.—Normal placenta with almost central insertion of cord.

These anomalies may interfere with the foetal circulation and sometimes cause foetal death.

When the cord is round the neck several times, it not only tends to strangle the foetus but also causes deflexion of the head, and occasionally the relative length of the cord may be so seriously diminished that it may interfere with labour just as a short cord would.

(2) **Insertion of the Cord.** The normal insertion of the cord is more or less near the centre of the placenta, but in some cases the cord may be inserted to the margin of the placenta. This is known as a "*battledore*" placenta. In other cases the insertion may be into the membranes and not into the placenta. Here the vessels of the cord pass between the membranes for a greater or less



FIG. 71.—Velamentous insertion of the cord.

distance before reaching the placenta. This is known as a *velamentous* insertion of the cord. If this leash of vessels happens to lie in the bag of membranes—*vasa prævia*—rupture of the membranes may involve one of the vessels and so cause hæmorrhage and death of the foetus.

(3) **Knots of the Cord.** These are generally formed in consequence of foetal movements. Knots may be either *true* or *false*. False knots are the result of a local increase of the Whartonian jelly. A true knot, on the other hand, is due to a loop in the cord through which the foetus has passed getting

tighter and tighter. As a rule knots are harmless, since the constriction is rarely tight enough completely to obliterate the lumen of the vessels and thus obstruct the passage of blood.



FIG. 72.—False knots in the cord.

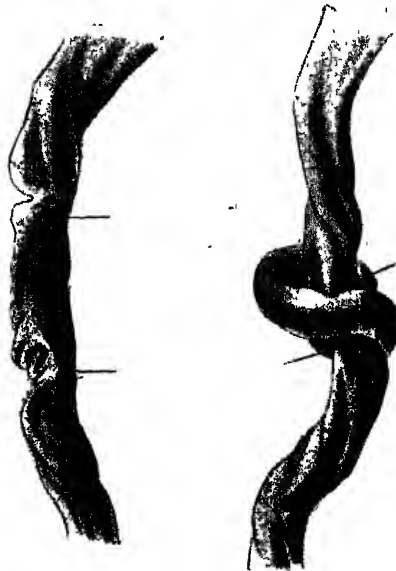


FIG. 73.—True knots.

Where, however, obstruction is caused, it tends to interfere with the development of the foetus and may even cause death of the foetus.

Among the other anomalies of the cord may be mentioned loops of the cord, torsion of the cord where the cord becomes twisted and sometimes so seriously as to interfere with the circulation, inflammation of the cord, tumours of the cord and anomalies of the vessels.

These conditions are not possible of diagnosis; nor is there any prophylactic or curative treatment possible where they give rise to serious symptoms.

Diseases of the Fœtus

FŒTAL SYPHILIS

Syphilis is one of the commonest causes of intra-uterine death of the fœtus, and the part played by this disease in the causation of abortion, still-birth, macerated fœtus and neonatal death is fully dealt with in the chapter on diseases complicating pregnancy.

Syphilis gives rise to characteristic lesions of the fœtus and it also affects the placenta. In cases where the child is still-born the spirochætæ can be demonstrated in the placenta and the liver, kidneys, adrenals and occasionally the lungs of the fœtus. The syphilitic fœtus may be undersized, and in some cases the skin covering the soles of the feet and the palms of the hand, is thickened, shiny, and peels off easily. The liver of the syphilitic fœtus is markedly increased in size with interstitial fibrosis and small round-cell infiltration. The changes in the bones are also characteristic; they are due to osteochondritis, so that there is no sharply divided zone of preliminary calcification between the cartilage and the growing bone. The bony lesions are widely diffused; they occur at the epiphyses of the long bones as well as in the phalanges. These bony changes are detected by means of X-rays, and this is therefore an accessory means of diagnosis in the intra-uterine condition as well as in children born alive with a syphilitic infection.

The changes in the placenta have been referred to. The placenta may be larger and paler in colour, relatively increased in weight in proportion to the fœtal weight, so that it may be one-fourth to one-third, instead of maintaining the usual proportion of 1:6. The maternal Wassermann reaction may be positive, but it does not necessarily connote the existence of fœtal syphilis; nor does a negative maternal Wassermann imply the absence of syphilis.

INTRA-UTERINE DEATH OF THE FŒTUS

There are many causes which may give rise to intra-uterine

partum hæmorrhages, certain general diseases of the mother, particularly acute infectious diseases, syphilis and occasionally the anæmias and chronic nephritis. Diabetes mellitus is responsible for the death of the foetus in the later months of pregnancy. Conditions associated with sudden rise or marked variations in temperature may also cause death of the foetus. Apart from these causes there are certain cases where intra-uterine death of the foetus occurs without any apparent cause. Sometimes habitual death of the foetus occurs at a particular period of pregnancy. It may be in the last trimester of pregnancy, or even at an earlier period. In a few of these cases a diseased condition of the placenta may be noted.

Treatment. Where a definite pathological entity can be ascertained this should be attended to. Syphilis, renal disease, anæmia, toxæmias and intercurrent diseases should receive attention. In those cases where habitual death of the foetus occurs at a particular period of pregnancy, the patient should be kept under observation, all possible precautions being taken in regard to diet, rest and habits. A method of treatment recommended in some of these cases is to give large doses of potassium chlorate, 10 grs. three times a day for a prolonged period, from the third month onward.

Where any definite deficiency, either in vitamins or endocrines, can be ascertained, this ought to be rectified. Vitamin E has been given in some cases with beneficial results. It is important that Vitamin E therapy be maintained until delivery at term. Aqueous corpus luteum extract may also be given for prevention and treatment of premature labour. Deficiency of endocrines, particularly the thyroid, should be dealt with. It is possibly in overcoming these three factors—vitamin deficiency, endocrine deficiency and deficiency of the hæmopoietic system—that the ultimate solution lies of preventing this unfortunate predisposition to habitual intra-uterine death of the foetus.

It was observed that in some cases a biochemical investigation of the blood constituents revealed that while the blood urea, blood calcium and blood cholesterol were more or less normal, there was a definite hypoglycæmia. On this basis glucose has been administered in large quantities. The subject requires further investigation.

A method of treatment that may occasionally be adopted is induction of premature labour, if the habitual death of the foetus occurs after the thirty-sixth week of pregnancy. This is a method which may be recommended in cases of diabetes in particular as we have found in them a greater tendency for death of the foetus to occur in the last weeks of pregnancy. This subject has been

referred to at greater length when considering diabetes complicating pregnancy.

Developmental Anomalies of the Fœtus

These anomalies may be restricted to a single fœtus or may involve two fœtuses. Anomalies of a single fœtus are more common. Among these may be mentioned anencephalus, hydrocephalus, anomalies pertaining to the meninges, spinal cord, various anomalies of the thoracic and abdominal regions such as hydrothorax, dextrocardia, foetal ascites, congenital cystic kidneys, tumours of the liver, etc. Minor anomalies in regard to the extremities are not infrequent.

Among the more important of the anomalies from the obstetric point of view may be mentioned:—

- (a) Anencephalus.
- (b) Hydrocephalus.
- (c) Foetal ascites, congenital cystic kidneys, hydrothorax, etc.

ANENCEPHALUS

In this condition the head is imperfectly developed, particularly the vault of the skull and the brain. Most of these fœtuses are still-born. A few may be born alive but die within a very short time. The brain is in a rudimentary condition, and owing to the absence of the cranial vault the base of the skull can be easily felt so that even the sella turcica may be distinguished. The fœtus generally presents as a face presentation in view of the abnormal shape of the head.

The diagnosis can be made antenatally by a skiagram and by vaginal examination during labour.

Delivery is usually uncomplicated, excepting for the fact that in many cases the shoulders are bigger than normal and may become impacted, necessitating cleidotomy before delivery of the fœtus is accomplished.

Hydramnios is not infrequently associated with this condition.



Fig. 73a.—Anencephalic Fœtus.

HYDROCEPHALUS

This is a condition where the ventricles of the brain are distended with an excessive amount of cerebro-spinal fluid. Various degrees of hydrocephalus may be met with, and in some cases the hydrocephalic head may fill the greater part of the uterus. The foetus may present either by the cephalic or the podalic pole. If cephalic the enlarged head distends the lower uterine segment.

The diagnosis of a hydrocephalus is not always easy, and the condition may not be recognised till the woman has been several hours in labour. Careful palpation does not reveal the characteristic, hard, normally sized head. This should put the obstetrician on guard, particularly in those cases where the cephalic pole presents. When the cervix is dilated and a vaginal examination is made, the widely gaping sutures and the large fontanelles present a typical picture. "Islands of bones in a sea of membranes" tell their own tale. In breech presentations careful abdominal palpation may reveal the presence of the large, ill-defined and somewhat fluctuant head. In many cases, however, it is not till the breech is delivered up to the neck that the possibility of a hydrocephalus suggests itself because of the enlarged size of the uterus, together with difficulty in extracting the head.

Prognosis. The foetal prognosis is bad. Frequently the foetus is delivered still-born. Even when born alive its survival is a question of days. Cases of hydrocephalus develop a hopeless



FIG. 73b.—Hydrocephalus.

form of idiocy, and from every point of view the foetal prognosis is bad.

So far as the maternal prognosis is concerned much depends upon the treatment adopted. If a diagnosis is not made and improper treatment is resorted to, or if the case is left to nature, rupture of the uterus is inevitable and death of the mother will most probably result. When proper treatment is adopted and the delivery is conducted in as conservative a manner as possible, taking into consideration that the foetal prognosis is hopeless, there should be no increased risk of a pronounced nature to the mother.

Treatment. When labour has begun and the cervix is dilated to admit two or three fingers, the head should be perforated. Immediately this is done a large amount of fluid gushes out and the skull collapses, after which delivery may be left to natural efforts. If there is any necessity to accelerate labour, the cranioclast may be applied and delivery completed. When the foetus is presenting by the breech, a simple method of expediting delivery is to tap the spinal canal and so drain off the fluid. If the child has been delivered up to the neck, the head may be tapped through the base of the skull. In some cases it has been suggested that tapping through the spinal column may be resorted to as a means of saving the life of the foetus. How far this is a justifiable procedure in pronounced cases of hydrocephalus is a matter for serious doubt.

Foetal Ascites, etc. Enlargement of the body of the foetus due to fluid in the thorax or the abdominal cavity very often leads to difficulty in delivery. The foetus in such cases usually presents by the breech, and as soon as the lower extremities have been delivered and difficulty is encountered in the further delivery, a careful vaginal examination will reveal the tenseness of the abdominal cavity or of the thorax. The question of the life of the foetus does not arise in such cases, as the foetus is invariably dead or dying. A trocar passed into the abdomen or thoracic cavity will



FIG. 73c.—Foetal Ascites.

generally allow the fluid to drain away, and the rest of the delivery is fairly simple.

In cases of hydrothorax the child may present by the cephalic pole, and after the delivery of the head further progress is arrested. It may be necessary to cut through the costal cartilages to obtain sufficient shrinkage of the thorax to enable the further delivery to take place.

In cases where solid tumours or enlarged organs such as the liver obstruct delivery, evisceration is necessary.

DOUBLE MONSTERS

Double monsters or conjoint twins are of considerable interest both from the obstetrical and embryological points of view. Different types of such monsters are met with, ranging from two fully developed separate fetuses joined together, to monsters where the greater or lesser part of the anatomy is fused. Various classifications have been adopted to differentiate the many varieties of double monsters. From a clinical point of view, however, double monsters may be :—

- (a) Where both components are more or less of equal size and united in parts.
- (b) Where one of the components is fully developed and has attached to it a portion of the second twin.

From the obstetric point of view the second of these categories does not cause any significant obstruction. Fully developed double monsters, however, are a source of great difficulty in labour and



FIG. 73d.—Thoracopagus.

require considerable skill to effect their delivery without damage to the mother. Such double monsters may be further classified into :—

- (i) Those fused at the cephalic pole, so that the fused heads present the appearance of a single large one. These

are called *syncephalic monsters*. The majority of monsters are, however, *dicephalic*, that is, the two heads are separate.

(ii) *Thoracopagic monsters*. In this category the two monsters are fused at the thorax. The fusion may be limited to the thorax or may extend in part or whole to the abdominal cavity as well. Thoracopagic monsters are *dicephalic* and, depending upon the number of the upper and lower extremities, they may be *dibrachius*, *tribrachius*, *tetrabrachius* and *dipus*, *tripus* or *tetrapus*.

(iii) A third category is the *ischiopagus*, where the monsters are fused in the pelvic region. Many different varieties of such fusion may occur.

Anatomical Features. A careful dissection of these double monsters has revealed the presence of many anatomical abnormalities of an extraordinary character, which show how nature tries to circumvent the defects in her anxiety to regulate normal physiological action as far as possible. The circulatory system in particular is of special interest, and it will be seen that there are many variations of the foetal heart, ranging from a transversely elongated boat-shaped heart, situated in the median-line and enclosed in a single pericardial sac, to two hearts fully developed, united in the median-line in the region of the auricles by a transverse sac. In consequence of this the arterial system also is complex. The aorta on either side may fuse again at the level of the last thoracic vertebra, piercing the diaphragm and descending as the descending aorta, once more to give off the necessary branches depending upon the number of the lower extremities.

The alimentary system also is of interest. In some cases there is fusion of the two stomachs from which a common intestinal tract proceeds. On the other hand, the two stomachs may be entirely separate and the two duodenal canals may later fuse to form a single intestinal canal which bifurcates at the sigmoid end, giving rise to separate anal openings.

In like manner the respiratory and the nervous systems are complicated.

Labour complicated by Double Monsters. Of the many varieties of double monsters, the *dicephalic thoracopagi* give rise to the greatest difficulty in labour. The diagnosis is not generally made antenatally unless an X-ray has been taken. More often

such cases are mistaken for twins, and it is only when the woman is actually in labour and there is difficulty in delivery that suspicion is first aroused as to the possibility of locked twins. A careful internal examination at this stage will reveal the true cause of the dystocia. There are, however, several authentic instances on record of thoracopagi where natural delivery has presumably occurred and the conjoint twins have survived in some cases for years. Sometimes both the component halves of the double monsters may present by the breech; the body which is fused may be delivered without much difficulty, and then the first head enters the pelvis and is delivered by pulling the body well forward towards the mother's abdomen, after which the second head usually finds its way out. More frequently, however, the delivery of the cephalic pole presents considerable difficulty, and in such cases it may be necessary to decapitate one of the heads before the other can be delivered. After the delivery of the foetus the decapitated head can be expressed.

Cæsarean section undoubtedly offers a safer method of delivery both for the mother and for the foetus, and should be done in those cases where the diagnosis is made sufficiently early and the thoracopagic twins are fully developed.

In cases of syncephalic double monsters the difficulty is experienced in the delivery of the large head and may necessitate perforation before it can be extracted. In cases where the patient is seen late in labour and the cause of obstruction is due to a double monster, delivery may be attempted through the vaginal route by performing embryotomy. A safer method, if difficulty is experienced, is to deliver by the abdominal route and to perform a hysterectomy or to attempt exteriorisation of the uterus before effecting delivery.

CHAPTER XXII

ABORTION

By the term *abortion* is meant expulsion of the products of conception before the full formation of the placenta i.e. before 12 weeks. The word *miscarriage* is used to refer to expulsion of the ovum after the placenta is fully formed, that is after the twelfth week, but before viability of the child. When the foetus is expelled after the twenty-eighth week, but before full time, *premature labour* is the term applied.

Causation. There are many causes that may directly or indirectly bring about an abortion. Some are more obvious than

others. There are certain factors, yet ill-defined, and to these we shall refer a little later.

The causes may be classified into maternal, foetal and paternal:—

Maternal Causes. Among these are:—

- (a) General causes, and
- (b) Local or pelvic causes.

The general causes include certain diseases such as:—

(a) *Acute specific fevers*, notably influenza, pneumonia, relapsing fever, acute exanthemata, etc. It may be stated that abortion is more frequent in those types of fevers where the range of temperature is high and where the fever is associated with conditions in the lungs producing a degree of cyanosis. The sudden elevation of temperature and the increasing viscosity of the blood consequent on deficient oxygenation tend to bring about the death of the foetus and stimulate the uterus to action.

(b) *Syphilis*. This is one of the commonest causes of miscarriage. It should, however, be stated that the tendency in such cases is for the patient to abort at a more advanced stage of each succeeding pregnancy till perhaps she is delivered of a macerated foetus at term, and then at a still later pregnancy of a live baby which shows signs of neonatal syphilitic infection. Rarely are cases of repeated abortion, occurring more or less at the same period of pregnancy, due to syphilis.

(c) *Toxæmias of Pregnancy*. Chronic nephritis and certain toxæmias of pregnancy may bring about death of the foetus and favour abortion.

(d) *Poisons*. Lead poisoning, in particular, and also mercury, arsenic and phosphorus poisoning may cause abortion.

(e) *Nervous Factors*. Sudden shock, excessive fatigue or emotion may be responsible.

(f) *Diseases* such as tuberculosis, heart disease, diseases of the liver and lungs.

(g) *Certain endocrine disturbances*, such as those resulting from hypopituitarism, hypothyroidism, ovarian dysfunction and other conditions which are the result of deficiency of the sex hormones may bring about abortion.

(h) Lastly, certain deficiency diseases caused by lack or deficiency of vitamins, particularly vitamin E, are now recognised as possible factors.

Local Causes. Among these are:—

(a) *Inflammation of the Uterus*. This may be either endometritis or a metritis, or occasionally a decidua metritis. The

inflammation prevents the formation of a normal decidua so that the ovum is denied its proper nourishment and chances of development. This results in the death of the embryo and consequent abortion.

(b) *Displacements of the Uterus.* Retroversion and retroflexion play an important part in the causation of abortion. It is not merely by causing interference with the growth of the uterus that abortion results, but even in the early stages the chronic pelvic congestion and the associated changes in the endometrium consequent upon the backward displacement may lead to the death of the foetus and expulsion of the ovum.

(c) *Malformations of the uterus* and certain diseased conditions such as fibroids, polypi and lacerations of the cervix may all favour the occurrence of abortion.

(d) *Trauma.* Abortion does not readily occur merely because of a traumatic factor. The large number of cases where pregnancy has not been interfered with, even after a major surgical operation, go to prove that abortion does not easily occur under such conditions. In some cases, however, where trauma results in rupture of the membranes, or where other factors favourable for the cause of abortion are already present, abortion is precipitated.

(e) Inflammations of the adnexa or of the pelvic cellular tissue may occasionally cause abortion.

(f) Lastly, abortion may result from actual interference due to a therapeutic or criminal induction.

Foetal Causes. Conditions which bring about death of the foetus are certain to cause abortion. They are:—

(a) Diseases of the chorion (hydatidiform degeneration) result in the death of the foetus and degeneration of the chorionic villi and lead to the termination of pregnancy.

(b) Certain diseased conditions and abnormalities of the placenta such as syphilis, placentitis, endarteritis, infarction and conditions which are commonly known in the later weeks of pregnancy as placenta prævia and abruptio placentaë, although not designated as such in the earlier weeks of pregnancy.

(c) Anomalies of the cord such as twists, knots and abnormal insertions may lead to death of the ovum and abortion.

(d) Diseases of the amnion. Hydramnios, oligohydramnios, amniotic adhesions, etc., may likewise lead to death of the foetus and the termination of pregnancy.

Besides these causes, malformations of the foetus and certain diseased conditions of the mother which bring about death of the foetus, to which reference has already been made, may favour abortion.

Paternal Causes. Under this heading the commonest condition recognised as being responsible is syphilis. In some cases general debility may also be a factor in favouring abortion owing to weakness of the spermatozoa. The occurrence of an infective discharge may lead to the simultaneous infection of the uterus and thus favour septic abortion.

Investigation of Causes. In every case where abortion occurs a systematic investigation should be made to find out the cause. Besides a general examination of the patient to ascertain the presence of any constitutional diseases such as tuberculosis, syphilis, diseases of the kidney, or of the heart, or liver, a thorough hæmatological examination should also be made. A biochemical analysis of the blood is desirable to ascertain whether there is any particular factor such as deficiency of calcium. The urine should be tested for the presence of albumin, sugar and other abnormalities. The diet of the patient should be carefully investigated to find out any vitamin deficiency. An examination of the endocrine system is necessary to ascertain whether any appreciable evidence of one or other of the factors such as hypopituitarism or hypothyroidism is present. A neurological examination of the patient is also useful in certain conditions. After the general constitutional factors have been thoroughly investigated, an inquiry into the surroundings, the mode of life and the occupation should be made.

The local examination should include an investigation of the cervix, of the position of the uterus, the condition of the adnexa, the presence or otherwise of any discharge and the nature of such discharge.

A serological examination as well as an examination of any vaginal discharge should always be made.

At a later stage, after the abortion is over, it is desirable to curette the uterus and submit the curettings for a pathological examination.

No particular factor can be put down as positively the causative factor unless a thorough investigation is made on the lines suggested above.

Signs and Symptoms. The signs and symptoms of abortion are :—

- (1) Pain, due to uterine contractions.
- (2) Hæmorrhage, the result of separation of the ovum.
- (3) Dilatation of the cervix, due to the uterine contractions.

The patient generally gives a history of amenorrhœa followed by more or less severe pain in the lower abdomen and back accompanied by vaginal bleeding. The extent of the hæmorrhage varies and may sometimes be so considerable as to cause severe collapse. Usually, however, the hæmorrhage continues for some days, the quantity varying from day to day. The pain may be severe, but is never so great as in cases of ruptured ectopic gestation. Where pain and hæmorrhage are present, dilatation of the cervical canal may be present and occasionally a portion or the whole of the uterine contents may be expelled. Depending upon these signs and symptoms, the following types of abortions may be recognised.

(1) *Threatened Abortion.* In this condition, after a period of amenorrhœa, the patient complains of slight colicky pains in the lower abdomen associated perhaps with backache, frequency of micturition and slight hæmorrhagic discharge *per vaginam*. If a careful bimanual examination is made the cervix will be found softened, the uterus enlarged and more or less globular, the size depending on the period of pregnancy. The os is generally closed or may in some cases be slightly patulous. Where there is no actual sign suggestive of death or expulsion of a portion of the ovum, the condition is known as 'threatened abortion'.

(2) *Inevitable Abortion.* This term denotes that the ovum has practically separated from the uterine wall and is therefore dead and bound to be expelled. In such cases the pain is more severe, the bleeding more profuse, the cervix is dilated, and occasionally a portion of the ovum may be felt protruding through the cervical canal.

(3) *Complete Abortion.* This term is used when the whole of the ovum has been expelled. Once this has occurred the pain subsides and bleeding decreases and may have stopped by the time the patient is seen. The uterus is empty and is accordingly smaller in size than the period of amenorrhœa would suggest and the cervical canal may be closed as it contracts very rapidly after complete expulsion of the uterine contents.

(4) *Incomplete Abortion.* When a portion only of the ovum has been expelled outside the uterus, the condition is spoken of as incomplete abortion. In the early weeks before the full formation of the placenta the whole of the ovum is generally expelled entire. In some cases, however, a portion may become detached and is expelled, the rest of it remaining within the uterus. After the formation of placenta the fœtus may be expelled and the placenta retained in part or whole. In such cases the patient usually

complains of periodic attacks of pain, accompanied by a certain amount of hæmorrhagic vaginal discharge. If what has been expelled from time to time is carefully preserved and examined, it will be noted that the products of conception passed are not complete. A vaginal examination may reveal the presence of some portion of the ovum protruding through the dilated cervical canal. In other cases the uterus may still be found to be somewhat enlarged, but the cervix is closed and there is blood on the examining finger. Where there is any doubt about the uterus being completely evacuated it is justifiable to explore the uterine cavity under anæsthesia after preliminary dilatation of the cervix.

RARER FORMS OF ABORTION

(1) *Cervical Abortion*. This is a somewhat rare form and is due to the expulsion of the products of conception from the uterus into the cervical canal where they are retained because the external os remains closed. There is a certain amount of pain associated with hæmorrhage. After some time the bleeding may stop. On a vaginal examination the external os is found closed, but the cervical canal is ballooned out and is like an inverted cone due to the presence of the ovum therein.

(2) *Missed Abortion*. In this rare condition symptoms of abortion occur but subside later without any part of the ovum being expelled. The ovum dies but is retained in the uterus. The patient gradually recovers from the attack of pain and the vaginal hæmorrhage subsides. The hæmorrhage that has occurred *in utero* forms a clot round the dead ovum and changes take place subsequently in and around the ovum. In the early stages the clotted blood with the contained ovum presents a peculiar condition which is known as a *blood mole*. Later, when the blood clot becomes organised the appearance changes, and in the course of a few weeks the whole of the uterine contents are changed into a whitish shaggy mass known as a *carneous mole*. Occasionally in these cases, owing to the formation of hæmatoma of varying size between the amniotic and the chorionic membranes, a further change takes place resulting in the formation of what is known as a *tuberosc mole*. Where a mole has developed the foetus may not be present, or even if it does exist it is of very small size. This is due to the fact that in the large majority of cases molar formation takes place in the early weeks of pregnancy, and because of the death of the foetus at that stage and the considerable period that elapses before the mole is expelled, together with absorption of the foetus, the foetus is either rudimentary or entirely absent. Where molar formation has taken

place the amenorrhœa may persist but none of the progressive signs of pregnancy are present. Thus the uterus does not continue to enlarge in size, the breast changes cease, the patient may not feel any of the subjective symptoms of pregnancy, and generally presents herself at the out-patient clinic for the persistent amenorrhœa. A bimanual examination will reveal that the uterus, though enlarged, never corresponds to the period of amenorrhœa, the cervical softening does not persist, and the uterus itself does not have the soft feel or globular shape of a normal pregnancy. If a pregnancy test—Aschheim-Zondek or Friedman's test—be done at this stage the result will be negative. Where the uterus is of a fairly large size a roentgenogram may reveal the absence of any foetal skeleton.

(3) *Febrile Abortion*. Where signs and symptoms of abortion exist with a rise of temperature the condition is spoken of as febrile abortion. This may be due to two distinct factors:—

(a) In one set of cases the rise of temperature may precede the signs and symptoms of abortion and may be the causative or at least one of the causative factors. In such cases the usual symptoms of abortion are present—pain, hæmorrhage, etc.—and the temperature is the cause and not the result of abortion.

(b) *Septic Abortion*. Here the temperature is entirely due to the presence of a septic focus. In these cases the rise in temperature is due to sepsis, and the patient, besides presenting the usual symptoms of pain and hæmorrhage, will also have an offensive discharge *per vaginam*.

The two conditions must be well differentiated as the treatment will be found to differ with the particular type of febrile abortion.

(4) *Therapeutic Abortion*. Where abortion is induced as a therapeutic measure for the sake of the mother, the condition is spoken of as therapeutic abortion. The indications for therapeutic abortion are becoming more and more limited, and it is scarcely justifiable nowadays, except in the presence of some very definite factor, to resort to therapeutic abortion. Conditions like active tuberculosis, certain types of cardiac disease, renal diseases and toxæmias of pregnancy, such as hyperemesis gravidarum, chorea gravidarum, etc., may occasionally necessitate therapeutic abortion. It is essential in every one of these cases to be armed with a second independent medical opinion before resorting to this procedure. It is hardly necessary to state that therapeutic abortion is not the method of treatment in cases complicated with varying degrees of contraction of the pelvis; nor should it be thought necessary to resort to it as a measure of relief in the acute or chronic general diseases.

(5) *Criminal Abortion.* This term is applied where abortion is induced with a criminal intent. According to the law of the land it is an offence to interfere with pregnancy for any reason other than therapeutic causes, and even then not unless a second medical opinion favours such a measure. Criminal abortion, unfortunately, is practised in most countries and is one of the potent factors in the causation of maternal mortality and morbidity.

Diagnosis. The diagnosis of the different forms of abortion depends upon the signs and symptoms already mentioned. Certain conditions have to be differentiated from abortion. Prominent among these are:—

- (1) Ectopic gestation.
- (2) Hydatidiform mole.
- (3) Functional menstrual disturbances.
- (4) Tumours of the uterus such as myomata.
- (5) Carcinoma of the uterus.

To take the last three conditions first, it is generally easy to differentiate between these and abortion. In functional menstrual disturbances the woman has irregular menstruation; there may be amenorrhœa for periods varying from six to eighteen weeks but the history is generally suggestive. A profuse bleeding occurring at the end of that period may suggest the possibilities of an abortion, but a careful bimanual examination will reveal that the size of the uterus is not increased, that its shape is not changed, that there is nothing suggestive of pregnancy so far as the condition of the cervix is concerned, and that the hæmorrhage is unassociated with the passage of any products of conception. In cases of doubt an Aschheim-Zondek test or a Friedman's test will be helpful.

Tumours of the uterus such as fibromata do not give rise to the period of amenorrhœa preceding the hæmorrhage. The shape and size of the uterus also are factors to be taken note of. Few of the early symptoms of pregnancy will be present; occasionally the breasts may show certain changes, but the Aschheim-Zondek test will always be negative.

Carcinoma of the cervix or body of uterus. It is rarely that difficulties will arise in the diagnosis of this condition. In some cases pregnancy may be associated with carcinoma, when the case may be mistaken for one of abortion. A vaginal examination will, however, reveal the cause of the hæmorrhage if the growth is in the cervix. The hardness, the ulceration, the reddish appearance and, if necessary, a biopsy will settle the diagnosis.

When carcinoma exists in the body of the uterus, pregnancy is not likely to occur. In those rare cases where it does occur the

diagnosis is very uncertain till the abortion has become complete. A microscopical examination of the scrapings of the uterus may reveal the nature of the disease.

The chief conditions to be differentiated in hæmorrhages occurring in the first trimester of pregnancy are abortion, extra-uterine pregnancy and vesicular mole. The following table will help in elucidating the particular condition responsible for the bleeding:—

ABORTION.	EXTRA-UTERINE.	VESICULAR MOLE.
	<i>Condition of the Patient</i>	
Depends upon the amount of external bleeding, and the collapse is proportionate; there is no shock.	The shock and the collapse are very great, the collapse being out of all proportion to the amount of external bleeding.	There is little shock but the collapse is severe, depending upon the extent of the bleeding.
	<i>Pain</i>	
Is intermittent but not unduly severe.	Sudden, very severe pain followed by faintness.	Pain of a mild degree or no pain at all in early stages.
	<i>Hæmorrhagic Loss</i>	
There is a certain amount of bleeding, sometimes profuse.	Bleeding per vaginam may occur in small quantities. It is never profuse and may be bright red in colour as in cases of abortion and is sometimes granular.	Bleeding may be profuse.
	<i>Size of Uterus</i>	
Proportionate to the period of amenorrhœa.	Much smaller than the period of amenorrhœa warrants; uterus pyriform in shape.	Much bigger than the period of amenorrhœa warrants, soft and boggy.
	<i>Condition of the Adnexa</i>	
The adnexa may be normal.	Unilateral pulsatile painful and tender swelling in one or other of the lateral fornices or in Douglas' pouch.	The adnexa may not be involved, or in some rare cases bilateral cystic swellings may be felt on either side of the uterus, but not intimately connected with the uterus, and not painful or tender; not pulsatile.
	<i>Contents Passed</i>	
Portions of the ovum may be passed, or the whole sac may be expelled.	A decidual cast may be passed entire or in portions. An examination of the cast would reveal the absence of chorionic villi.	Occasionally the characteristic cysts may be passed which appear like white currants in a red jelly.

DIAGNOSIS OF THE DIFFERENT VARIETIES OF ABORTION

Threatened Abortion. In this condition the history of amenorrhœa, the slight pain and bleeding and the occasional palpation of the uterine contractions associated with the pain, suggests the case being one of threatened abortion. On bimanual examination the enlarged globular uterus contracting occasionally, the bloody discharge and, in some cases, particularly in multiparæ, the slight dilatation of the cervix suggest the possibility of abortion. It is impossible in these cases, at the first examination and even for some time later, to be definite as to the diagnosis of threatened abortion, or of any of the other varieties. The safe rule in such cases is to treat every case as one of threatened abortion, till such signs and symptoms manifest themselves and make it possible to classify it under one of the other varieties described.

Inevitable Abortion. This condition is more easily diagnosed, as certain positive findings must be present before one can consider a case inevitable. Usually, besides the pain and hæmorrhage, there is dilatation of the cervical canal. The external os generally admits the finger and on bimanual examination the ovum can be felt. Occasionally portions of the decidua or the ovum are expelled. The hæmorrhage may be profuse.

Incomplete Abortion. The question often arises, and it is sometimes very difficult to decide definitely whether abortion is complete or otherwise. The history may be useful but is not conclusive. The examination of the patient bimanually may help to some extent. The size of the uterus, the extent to which the cervical canal is still open, the amount of bleeding, the palpation of any shreds of membranes or placenta, or foetal remnants are all points which favour the conclusion that the abortion is incomplete. An irregular, continuous hæmorrhage, even very small in amount, with or without pain, with occasional bouts of hæmorrhage occurring in between, always suggests the possibility of some bits of tissue having been left behind. In some cases the diagnosis is conclusive only when the uterus is explored either by a curette or by the finger.

Cervical Abortion. This condition can be diagnosed by the history as well as by the local findings. The fullness of the cervical canal and the manner in which it is dilated in the form of an inverted cone indicate that the separated ovum is lodged in the cervical canal. Occasionally, if the external os is slightly patulous, the ovum may be felt by the examining finger.

Missed Abortion. The diagnosis of this condition is by no means easy. The history of the case is of considerable value, and

it is often only by observing the case for some time that a definite diagnosis can be reached. In cases of missed abortion several changes may take place in the ovum. If the patient is examined at intervals it will be found that while the uterus does not enlarge to correspond with the period of amenorrhœa, and although it is bigger than normal, the size at subsequent examinations is either stationary or shows some slight diminution. The persistence of the amenorrhœa and of the uterine enlargement without increase, together with retrogressive changes in the other signs of pregnancy, arouse the suspicion that it may be a case of missed abortion. The ovum can be retained till the period of normal gestation is over, and in some cases even for a much longer period.

Prognosis. The prognosis depends upon any complication that may be present. Usually the bleeding is not marked, and the expulsion of the products of conception may take place spontaneously without any undue risks to the mother. In some cases, however, severe hæmorrhage and collapse may result, and if not attended to in time may entail grave risk to life. Where abortion is complicated with other conditions, or is a result of general or constitutional diseases, the prognosis is rendered worse. Factors which influence the prognosis unfavourably in cases of abortions are:—

- (1) Excessive amount of hæmorrhage.
- (2) Presence of constitutional disease.
- (3) Presence of sepsis.
- (4) The time at which assistance is available and the method of treatment adopted.

The patient may recover from the effects of abortion but certain sequelæ may persist such as subinvolution, displacements of the uterus and adnexal troubles. It is unfortunate that many patients do not realise that there is as much need for rest and proper attention after an abortion as after a full-time labour, and the frequency with which complications and sequelæ occur after abortion is due in a large measure to neglect on the part of patients to take proper rest and care.

Prophylaxis. Whenever there is a history of previous abortion the patient should be carefully examined along the lines which we have indicated above. In many cases if the conditions likely to cause abortion, such as chronic inflammation of the uterus or appendages, or displacements of the uterus, are treated prior to pregnancy the abortion may not occur. In particular, attention must be drawn to the possibility of syphilitic infection, septic foci,

endocrine disturbances and deficiency diseases. When pregnancy occurs, care should be taken to see that the patient has rest particularly at the time corresponding to her menstrual cycle, that uterine sedatives are given in cases with history of previous abortions, and that any other particular causative factor is properly treated. No purgatives should be given in the first half of pregnancy, but the bowels must be carefully regulated by mild laxatives or enemata. The diet of the patient should be specified. Particular care should be taken at the probable dates of the menstrual epoch when the tendency to abort is greater than during the intervals. Too much emphasis cannot be laid on the fact that at these times absolute rest is essential. In such cases the patient should not be allowed to move about freely till after the twentieth week.

Treatment.—Threatened Abortion. The patient should be put to bed immediately and complete rest ordered. Any examination that may be necessary should be done with the greatest amount of care and gentleness. It is well to give the patient $\frac{1}{4}$ grain of morphia or any other preparation of opium, either by mouth or hypodermically. A general and uterine sedative is indicated and a common prescription for this purpose is:—

Extractum viburnum prunifolium liquidum	•	$\frac{1}{2}$ drachm
Calcium lactate	•	10 grains
Liquor morphia hydrochloride	•	10 minims
Sodium bromide	•	10 grains
Tincture aurantii	•	15 minims
Tincture belladonna	•	5 "
Aqua to make	•	1 oz.

In some cases small doses of ergot, 5 minims of the liquid extract may be added with a view to tone up the uterine muscle and prevent hæmorrhage. 5 mgms of corpus luteum extract may be given daily.

The diet should be light and nutritious. Two particular precautions must be taken: the patient should on no account be given any purgatives and the bowels must never be allowed to become constipated. A glycerine enema or a small soap and water enema, or one or other of the different preparations of liquid petroleum is indicated. It is well to keep the patient in bed for a few days after the bleeding has completely stopped. Recovery from this condition may be said to have taken place when the hæmorrhage stops, the pain subsides and examination after an interval reveals that the uterus is gradually increasing in size. On the other hand, in some cases the hæmorrhage continues more or less irregularly, sometimes freely and sometimes in small quanti-

ties. Under these circumstances the question arises, when a case of threatened abortion may be considered to have become inevitable? It is important that this fact should be recognised, as the treatment necessarily differs in the two conditions. The following signs and symptoms indicate that a case of threatened abortion is no longer such but has become inevitable:—

- (1) If there is very profuse bleeding with dilatation of the cervical canal and portion of the ovum is felt.
- (2) If portions of the decidua or ovum are actually expelled outside.
- (3) If there is repeated small attacks of hæmorrhage continued over a fairly long period, two or three weeks, resulting in secondary anæmia.
- (4) If a bimanual examination reveals that the uterus has not increased in size and that probably it is gradually diminishing.
- (5) When there is an offensive discharge suggestive of sepsis attended with an elevation of temperature.

In such cases the treatment is that of inevitable abortion.

Inevitable Abortion. In these cases the abortion is bound to occur, but the question is whether any active interference is

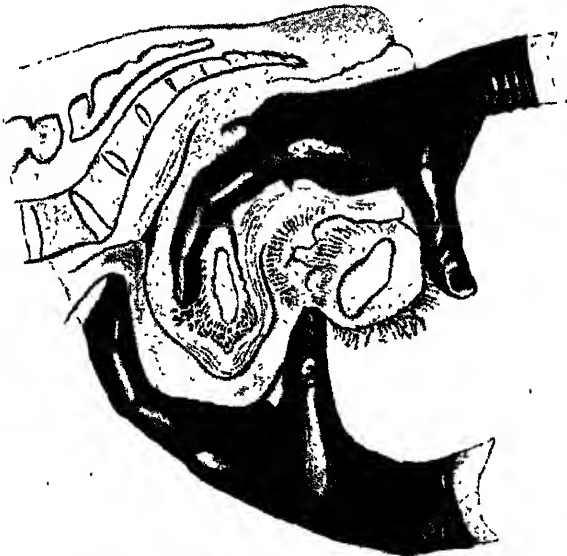


FIG. 74.—Digital evacuation of the uterus.

indicated or not. No definite rule can be laid down, but it may be safely said that the less of interference the better. In the majority of cases inevitable abortion will end spontaneously, and

we cannot deprecate too much the impression that once the abortion is inevitable it must necessarily be interfered with. On the other hand, in the presence of severe hæmorrhage or repeated small hæmorrhages, or if the pain is very severe, or if a portion of the ovum has actually been passed out and the cervix is gaping, it is necessary to evacuate the uterus. In those cases where interference is indicated the following method may be adopted. The patient should in every case be prepared properly, bowels relieved by enemata, a vaginal douche given if necessary, the vulva shaved and prepared with strict antiseptic precautions and the patient anæsthetised. If the cervix is dilated sufficiently to admit a finger freely, and if the period of amenorrhœa is within twelve to fourteen weeks, the ovum is separated gently from the uterine wall by the finger. The procedure will be considerably facilitated by the other hand applied suprapubically pressing the fundus downwards so that it is brought within reach of the vaginal finger. If the ovum has been entirely separated it may be removed by expressing it manually, or if this is not possible it can be removed by ovum forceps or sponge forceps. Where the cervix is not sufficiently dilated preliminary dilatation is necessary. After the cervical canal has been dilated up to the largest size Hegar's or Mathew Duncan's dilators, the finger is passed and the ovum gently separated. Care must be taken in dilating the cervix and in separating the ovum to prevent perforation of the uterus. The ovum thus separated is removed either by ovum forceps or by the sponge forceps. The ovum forceps is bigger in size and it may be difficult to pass it through the cervical canal. We therefore prefer to use sponge forceps in such cases, as it is smaller and can be easily passed in to grasp the ovum. With gentle twisting and light traction the whole of the ovum can be removed with ease. A hot vaginal or intra-uterine douche may be given, followed by injections of ecbolics, such as pituitary extract and ergometrine. The patient is returned to bed and the subsequent care is similar to that given in the puerperium after normal labour.

Another method of dealing with these cases is by tamponade of the vagina. Where the cervix is not easily dilatable and the patient is bleeding, particularly if pregnancy is advanced beyond the twelfth week, it is well to apply a vaginal tampon after taking due aseptic precautions. The tampon may be left in for periods ranging from twelve to twenty-four hours. If the uterus begins to contract there is no necessity to give any drug, but if the uterus is soft and there are no contractions, it is as well to provoke uterine contractions by giving small doses of pituitary extract—†

to $\frac{1}{4}$ c.c. every four hours. It is sometimes found that the ovum has been expelled from the uterus and is lying in the vagina above the tampon, or the cervical canal may be sufficiently dilated to allow of evacuation in the manner already described. In some cases when the plug has not caused cervical dilatation it may be necessary to replug the vagina, or cervical dilatation may be proceeded with by the use of metallic dilators and the uterus evacuated.

The use of a flushing curette in cases of abortion has its limitations. When a curette is used it must be a blunt flushing curette, and its chief use is not so much actually to remove the remnants of the ovum from the uterine attachment as by the mechanical flushing to allow the ovum which has been partially separated to become completely separated and so facilitate removal. The curette may be used, but we would emphasise the necessity for exploration of the uterus by the finger after such a procedure, as not infrequently large bits of placenta or ovum are left inside after an apparently thorough curettage of the uterus. In some cases after removal of the ovum an intra-uterine douche may be given to wash out any small bits of placenta or blood-clot that have been left behind. Budin's intra-uterine nozzle or Bozeman's intra-uterine catheter is used for this purpose.

Where the cervix is hard and not easily dilatable, and where the signs and symptoms point to a rapid evacuation being necessary, it is well to consider the possibility of evacuating the uterus by vaginal or, in some cases, by an abdominal hysterotomy. This may also be the line of treatment adopted in cases of therapeutic abortion, as by this procedure there is much less shock, less hæmorrhage and less chances of sepsis. In cases complicated by heart disease, or tubercle of the lung, or certain general diseases, it is better to employ either of these methods of evacuation, particularly if the pregnancy has exceeded fourteen to sixteen weeks, than the ordinary vaginal methods.

There is one procedure which does not commend itself to us, and that is the use of laminaria tents for dilatation of the cervix in cases of abortion. The tents are likely to carry infection and it would be unfortunate if sepsis were to complicate the subsequent stages of the condition.

Missed Abortion and Cervical Abortion. In either of these conditions active measures are necessary to evacuate the uterus. In some cases it is true that the patient may have a sudden hæmorrhage and the uterus empties itself spontaneously. But when the diagnosis has been definitely made it is not desirable to

wait for such an occurrence, and the evacuation of the uterus by operative procedure becomes a matter of necessity. The cervix is dilated by passing a few metal dilators, the vagina plugged and the patient given an injection of pituitary extract. After eight to twelve hours the condition of the cervix may allow of the uterus being evacuated, if it has not already expelled the ovum. An alternative method is the use of intramuscular injections of estrodiolbenzoate, 200,000 international units or intramuscular injections of oestroform, stilboestrol or clinistrol in large doses every eight hours. Usually the evacuation is completed in 48 hours if this method is effective.

On the whole, in the absence of definite indications, we prefer the conservative method of treatment in cases of abortion, and we have seen no harm result from this procedure. Where, however, indications arise on account of continuous hæmorrhage, severe pain or other causes, one may be forced to interfere.

Febrile Abortion. Where signs of abortion are present, associated with elevation of temperature, the condition may be due either to a septic factor or to a complication which causes the temperature and is probably also the cause of the abortion. In the latter group of cases there may be no necessity for interference and the abortion will terminate spontaneously unless severe Hæmorrhage occurs, when it may be completed by any of the methods already suggested. Where, however, the abortion is complicated with sepsis and is incomplete, particular care is required in the treatment. In many cases septic abortion may be the result of active interference, and in some it may be due to previous diseased conditions of the vagina or cervix. The most beneficial line of treatment in such cases is never to interfere as long as the patient has an elevation of temperature. The patient should be kept at rest, drainage favoured by raising the head of the bed, mild vaginal douches given if necessary and the general condition of the patient improved. For sepsis, sulphonamide therapy must be instituted. After the temperature has settled down to normal and has continued to remain normal for four to five days, the question of evacuation may be considered. If, however, at any stage during this interval profuse bleeding occurs, which necessitates interference, the uterus is emptied by gentle digital evacuation.

We cannot emphasise the fact too strongly that expectant methods of treatment give the most satisfactory results in cases of infected abortion. Active interference and emptying of the uterus are associated with serious risks. They spread the infection by breaking down the barrier of leucocytic layer which has formed

in the uterus. This results in a rise of temperature which may persist for days. It is therefore accepted now as a safe policy that in cases of infected abortions, whether associated with temperature or not, there should be the minimum amount of interference.

One method of treatment should be avoided in cases of infected abortion, and that is plugging of the vagina. This carries with it certain definite risks of retaining the septic discharges and favouring absorption and spread of infection.

Post Abortal Tetanus: Tetanus occurs more frequently after abortion than after full term delivery and more often after criminal than after spontaneous abortion. Onset of symptoms occurs between the sixth and twelfth post-abortal day, though occasionally symptoms have been reported earlier, in rare instances occurring immediately after termination of pregnancy.

The following routine treatment may be adopted. The patient is placed in a quiet room shielded from noise and external stimuli. She is given $7\frac{1}{2}$ grains of sodium amytal orally or an intravenous injection may be given in severe cases. This is repeated at sufficiently frequent intervals to maintain a narcotised state until all danger of spasms has passed. The patient is tested for sensitisation to antitetanic serum. Antitetanic serum is then administered; 50,000 units intramuscularly, 50,000 intravenously. If the incubation period has been short or if symptoms are severe, intrathecal administration of 50,000 units of antitetanic serum may be added to the routine on each of the next three days.

Complications. *Perforation of the uterus*, especially when the uterus is retroverted or retroflexed, is a not infrequent occurrence and may be responsible for a fatal termination by causing peritonitis. In some cases the perforation may involve injury to the bowel or to the omentum. Where such injury complicates the perforation, or where internal bleeding is suspected, it is necessary to perform a laparotomy and to repair the damage, otherwise expectant treatment suffices.

Hæmorrhage is another common complication and may sometimes be alarming. Injection of ecbolics, plugging of the uterus and the vagina if necessary, elevation of the foot of the bed and general treatment for the collapse should be adopted.

Another complication is where the operation has not resulted in a complete evacuation of the uterus. When small bits of placenta are left behind they continue to cause hæmorrhagic discharge, and occasionally a placental polypus may form at a later date. They may also give rise to secondary infection. Where a portion of the foetus itself is left behind decomposition is bound to occur, resulting

in septic discharge, elevation of temperature, passage of small bits of the foetal remnants associated with increasing pain and discomfort. Treatment is along lines already indicated for incomplete abortion.

A mistake which is so tragic in its results is to curette the uterus when the condition is one of a ruptured ectopic gestation, which is referred to in the chapter on extra-uterine pregnancy. Immediate laparotomy is the only possible method of dealing with that condition.

HABITUAL ABORTION

This unfortunate occurrence is fairly common and gives rise to some anxiety as to the proper method of treatment to be adopted. The most careful examination of several of these cases has revealed no obvious causative factor. When a woman comes with a history of repeated abortion, sometimes seven or eight or even more, occurring more or less at the same period of pregnancy, between the twelfth and twenty-eighth weeks, the condition requires thorough investigation from all points of view. As we have already stated, in our experience syphilis is not the factor responsible for such repeated abortions. Toxæmias, diabetes, displacements of the uterus, cervical erosions, deficiency in diet, hypothyroidism and other endocrine disturbances may all be considered as factors directly or indirectly favouring the occurrence of this condition and must receive proper and adequate treatment. The patient should be treated with a supporting diet with plenty of vitamins, particularly A, D and E. Calcium must be given in fair doses if there is any evidence of hypocalcæmia. When pregnancy occurs the patient should be kept in bed, uterine sedatives administered, particularly at the menstrual epochs. It is well to gain the confidence of the patient and to instil in her sufficient encouragement so that the dread of abortion may not be constantly weighing with her. We have found it impossible to control the mental factor in some of our cases, and in spite of all precautions they have promptly aborted on the day or about the week when they expected the abortion to take place. The treatment on the whole is not satisfactory, and further research into this baffling condition is necessary.

Endocrine therapy is frequently resorted to in cases of habitual and threatened abortion. Progesterone is used prophylactically in cases of habitual abortion. When confronted with cases of threatened abortion in which bleeding and cramps are not intense

nough to require immediate emptying of the uterus, Progesterone is also used. It is also used by some in cases of Placenta Prævia, abruptio, placenta, in an effort to diminish uterine contraction with the double object of stopping bleeding and prolonging gestation. With the same objective it is used in cases of habitual premature delivery, while its use has been extended to some cases of severe after pains in the early puerperium. While results in many cases seem to be good, there is no scientific proof that progesterone is the specific some physicians believe it to be.

When Progesterone is used, the dose should seldom be less than 5 mg. a day. If contractions and bleeding increase after injections, use of this hormone should be stopped. In cases of habitual abortion, the patient should receive 5 mg. twice a week beginning shortly after onset of pregnancy and continuing through the seventh month.

Besides progesterone, vitamin E is advocated. In patients with hypo-metabolism Thyroid therapy may also be combined with the other therapeutic remedies suggested.

CHAPTER XXIII

ECTOPIC PREGNANCY

THIS term is applied to the condition where the fertilised ovum develops at a site outside the uterine cavity. The term "extra-uterine" is also sometimes applied, but strictly speaking this term

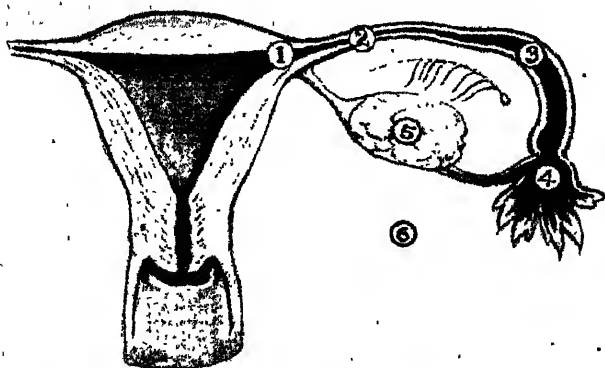


FIG. 75.—Section of the uterus and appendages. Posterior view showing the several sites of extra-uterine gestation.

does not include those rare conditions where pregnancy occurs in a uterine horn or where it occurs in the interstitial portion of the tube and impinges on the uterine cavity. Thus ectopic pregnancy

may occur not only in the Fallopian tubes and ovaries, but also in a horn of the uterus, or in the interstitial portion of the tube and the cornua of the uterus.

Varieties. The chief varieties are :—

- (1) Ovarian pregnancy.
- (2) Primary abdominal pregnancy.
- (3) Tubal pregnancy.
- (4) Pregnancy in a rudimentary uterine horn.

When an extra-uterine pregnancy occurs in the Fallopian tube it may occur in any of the following situations :—

- (1) In the interstitial portion.
- (2) Isthmial portion.
- (3) Ampullary portion.
- (4) Infundibular portion.

OVARIAN PREGNANCY.

This is a very rare occurrence, but several cases of true ovarian pregnancy have been reported in the literature.

Here fertilisation occurs in the Graafian follicle, so that the fertilised ovum implants itself directly into the ovarian tissue. Generally there is no decidual reaction in these cases.

The condition of ovarian pregnancy is difficult of diagnosis. Spiegelberg has laid down that the following four conditions must be fulfilled before ovarian pregnancy is diagnosed by examination of a specimen.

- (i) The Fallopian tube on the affected side must be intact.
- (ii) The pregnant mass must occupy the position of the ovary; and there should be no separate ovary on the affected side.
- (iii) The gestation sac must be connected to the uterus by the ovarian ligament.
- (iv) A histological examination must reveal the presence of definite ovarian tissue in the wall of the sac.

Although rupture is by no means uncommon in this condition, a greater proportion of cases of ovarian pregnancy reach full term than do cases of tubal gestation. Occasionally the ovum may be destroyed inside the follicle and thus a mole is formed.

Primary Abdominal Pregnancy. This is one of the rarest forms of extra-uterine gestation. Theoretically it is possible and a

few cases are reported in the literature. There is some doubt as to whether such cases are in reality cases of primary abdominal pregnancy or cases of secondary abdominal pregnancy. From a clinical point of view the differentiation is not important.

TUBAL PREGNANCY

Pregnancy may occur in any of the four situations, already mentioned, namely, in the interstitial, isthmial, ampullary or infundibular portions of the tube. Sometimes one may speak of a tubo-ovarian pregnancy where an infundibular gestation has become attached to the ovary.

It may be well here to state the normal process of fertilisation of the ovum. Usually the ovum, when it is extruded from the Graafian follicle, is wafted into the free fimbriated extremity of the Fallopian tube of the same side by the peritoneal fluid current that is set up. As a result of the ciliary movement in the Fallopian tube, as well as slight contractions of its musculature, the ovum is carried along the lumen of the tube where the spermatozoon generally meets it. Fertilisation then takes place and the fertilised ovum gradually passes on towards the uterus. The endometrium of the uterus is by this time prepared to receive the fertilised ovum, and the ovum thus settles on the lining membrane of the wall of the uterus and then burrows into it through the influence of its trophoblast.

In a case of tubal gestation, on the other hand, the normal course of events is interrupted either by mechanical factors or by some other factor which favours the development of the fertilised ovum in the tube. Among the mechanical factors may be mentioned.

- (1) An unduly long or tortuous tube.
- (2) Congenital anomalies of the tube such as diverticulæ.
- (3) Chronic salpingitis, favouring the destruction of the ciliated epithelium of the Fallopian tube and thereby interfering with the movement of the fertilised ovum, as well as by causing plicæ, adhesions and formation of lacunæ in which the ovum is trapped. The previous inflammation is generally of gonococcal origin, but may have originated during a previous puerperium.
- (4) Pressure from outside, compressing the lumen of the tube may be caused by tumours or inflammatory adhesions.

- (5) The fertilisation of a wandering ovum—that is, an ovum from the ovary on one side which wanders and enters the Fallopian tube of the opposite side; during this period the ovum is continuously developing and therefore has reached a size much bigger than is favourable for its transmission through the tube. At this stage of its development its penetrative properties have appeared. Hence it may burrow into the walls of the tube.

Mode of Implantation of the Ovum. When the fertilised ovum is arrested in any portion of the tube, it burrows itself into the wall of the tube on account of the eroding and penetrating properties of the chorionic epithelium. There is no real decidual formation or decidual reaction in the stroma of the tubal mucosa; there is, however, increased congestion and softening of the parts. The ovum, after burrowing rapidly into the softened and highly vascularised tissues, forms a capsule of the muscular tissue of the tubal wall. Because of the absence of decidual formation the destructive action of the trophoblast is not controlled and thereby the muscular wall of the tube becomes eroded; the erosion involves the blood vessels and the placental tissue has not a strong hold on the maternal tissues. As the ovum grows the muscular tissue attempts to hypertrophy; but the power of hypertrophy being very limited and nothing in comparison to that of the uterine musculature, the tube is not able to accommodate the growing ovum. The thinning of the Fallopian tube on account of the trophoblastic influence, uncontrolled by decidual cells, and the mechanical distension of the lumen of the tube by the growth of the ovum, result in early rupture of the tube.

Changes in the Uterus. Simultaneously with the changes in the tube the uterus in the majority of cases enlarges, but this is not proportionate to the enlargement that occurs in intra-uterine gestation; nor does the uterus assume the typical globular shape. There is a decidual reaction of the endometrium, which accordingly becomes thick and spongy and is similar to that of the decidua vera in a uterine pregnancy. It does not, however, contain any chorionic elements and is generally passed out of the uterus in whole or piecemeal at the time when the tubal gestation terminates either by rupture or by abortion. This constitutes the decidual cast.

TERMINATIONS OF TUBAL GESTATION

From what has been stated above, it is obvious that a tubal gestation cannot possibly go on for a long time without interrup-

tion. The possible terminations vary with the site of the gestation, and we will now consider each site and discuss the possible terminations.

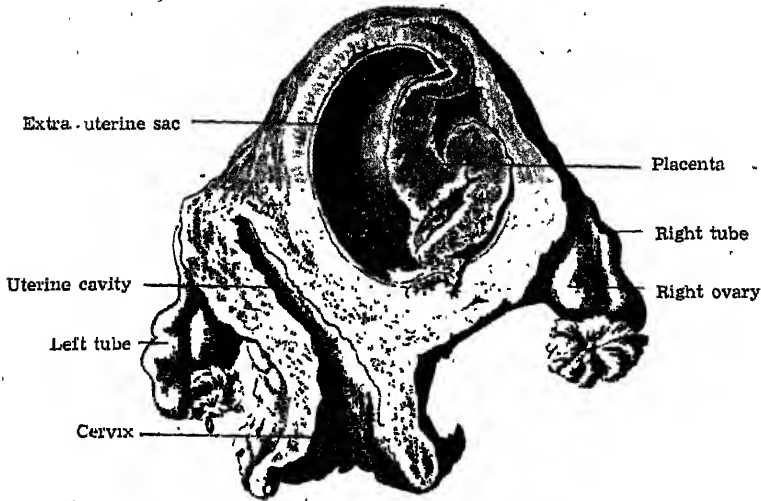


FIG. 76.—Section of an interstitial pregnancy.

A. Interstitial Pregnancy. Here the fertilised ovum is implanted in the interstitial portion of the tube, and it is possible for it to progress for a much longer period than in the other regions. The period of its continuation depends upon the extent to which the implantation involves some portion of the uterine cavity. The terminations in this condition are:—

- (i) Tubal abortion.
- (ii) Tubal rupture.
- (iii) Tubal mole formation.
- (iv) Tubo-uterine pregnancy.

Tubal Abortion. Owing to the situation of the ovum as it develops and the trophoblastic action on the blood vessel, intratubal rupture most commonly takes place and the mass is extruded towards the uterine cavity because of dilatation of the uterine end of the Fallopian tube. If the ovum is entirely expelled into the uterine cavity, hæmorrhage is checked by contraction of the muscular fibres of the uterus and the mass thus expelled out may be mistaken for an ordinary uterine abortion.

Rupture. By dilatation or by erosion, rupture may occur towards the peritoneal cavity. The hæmorrhage here is fairly

severe and death of the ovum generally takes place. In rare cases the rupture may not involve the placental site, and if the

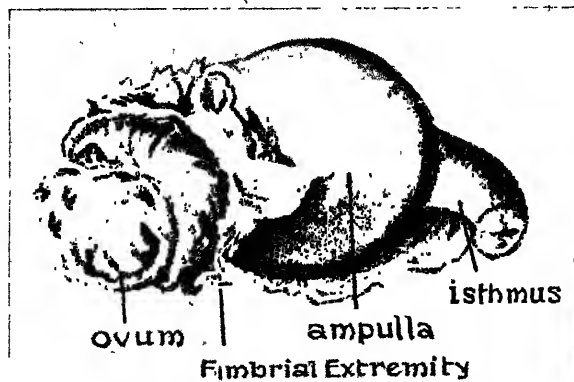


FIG. 77.—Tubal abortion.

Note the ovum just being expelled at the ampullary end.

amniotic sac is preserved intact the ovum may continue to grow, thus causing the condition known as secondary abdominal pregnancy.

Tubal mole is a comparatively rare ending to interstitial pregnancy. It is much more frequent in ampullary pregnancy and will be described later.

Tube-uterine Pregnancy. In some cases the ovum as it grows may partially embed itself on the uterine wall, and its further progress may be on the same lines as in a uterine pregnancy. It is difficult to differentiate this condition from a cornual or angular pregnancy.

B. Isthmial Pregnancy. Here the fertilised ovum implants itself in the middle and narrowest portion of the tube. Consequently rupture, which is inevitable, occurs at a much earlier stage, generally before the twelfth week and usually between the sixth and tenth weeks.

The secondary changes depend upon the site of the rupture with reference to the location of the placental site and the amount of hæmorrhage. As a result of rupture the following terminations may occur :—

- (1) Extratubal or intraperitoneal rupture with diffuse intraperitoneal hæmorrhage and death of the ovum and possibly the mother.
- (2) Extratubal rupture with death of the ovum and localised hæmorrhage with formation of blood-clot,

giving rise to the condition known as pelvic hæmatocele.

- (3) Extratubal rupture with continuation of the life of the ovum and a relatively small amount of hæmorrhage into the abdominal cavity (secondary abdominal pregnancy).
- (4) Extratubal or extraperitoneal rupture with diffuse sub-peritoneal hæmorrhage between the layers of the broad ligament and death of the ovum.
- (5) Extratubal rupture with a small amount of hæmorrhage between the layers of the broad ligament, resulting in death of the ovum and formation of a localised broad ligament hæmatoma.
- (6) Extratubal rupture with continuation of the life of the foetus and a small amount of hæmorrhage between the layers of the broad ligaments (secondary ligamentous pregnancy).

There is no possibility of a tubal abortion taking place in a case of isthmial pregnancy, and rarely does tubal mole formation occur in this condition.

We shall discuss these terminations further in detail.

Intraperitoneal Rupture. When intraperitoneal rupture takes place it is generally preceded by an intratubal rupture. As the blood is poured into the tube the lumen is distended and the weakened musculature of the tube yields, giving rise to rupture towards the peritoneal cavity. It is generally accompanied by a severe amount of shock as well as hæmorrhage, resulting in serious collapse of the patient. The death of the ovum is inevitable. These are the fulminant cases of rupture of extra-uterine gestation.

In some cases, however, the amount of hæmorrhage may not be so great, and with the death of the ovum the blood may gradually collect in Douglas' pouch resulting in the formation of a pelvic hæmatocele.

More rarely if the site of rupture is opposite the placental site, that is, if the placenta is situated towards the broad ligament and rupture occurs towards the peritoneal surface, the placenta may not be involved in the tear and there is a chance of the ovum continuing to survive, enclosed in its own amniotic sac. Thus results a secondary abdominal pregnancy which goes on to develop for some weeks.

Extraperitoneal Rupture. In this condition rupture occurs between the layers of the broad ligament, and it is practically

confined to cases of isthmal pregnancy as it is here that the broad ligament completely envelops either side of the tubal gestation mass. In such a case the rupture, if it involves the placental site, may result in a very severe form of hæmorrhage which extravasates between the layers of the broad ligament and gradually ascends up between the anterior abdominal wall and the peritoneal covering. The death of the ovum is inevitable and there is shock and collapse because of the separation of the peritoneal layer and the hæmorrhagic loss.

In some cases, however, the ovum may die, the hæmorrhage may not be considerable and the blood extravasated in between the layers of the broad ligament may coagulate, giving rise to a broad ligament hæmatoma.

Rarely when the rupture takes place opposite the placental site and when the placental site is situated towards the peritoneal surface the rupture may open up the broad ligament, and the ovum with the unruptured amniotic sac may be extruded partially, and continue to survive, resulting in the condition known as secondary ligamentous or intraligamentous pregnancy.

C. Ampullary Pregnancy. Here the ovum is implanted in the outer third of the Fallopian tube. As the ovum grows the ampullary portion is very much distended. The terminations that may occur in this condition are:—

- (i) Tubal abortion.
- (ii) Tubal mole, and
- (iii) Intraperitoneal rupture.

There is very little of the broad ligament which can stretch with the distending ampullary end, so that there is little or no possibility of an extraperitoneal rupture in such cases. Very rarely and particularly when the ovum is implanted almost at the infundibular end the pregnancy may continue to the later weeks as a tubo-abdominal pregnancy. *Tubal abortion* is by far the commonest termination. Intratubal rupture first occurs and the whole mass may then be expelled through the dilated fimbriated extremity. The mass thus expelled consisting of ovum and blood forms a pelvic hæmatocele.

Tubal mole is also likely to occur. This results from an intratubal rupture. In such cases the blood-clot surrounding the ovum becomes organised and results in the formation of a tubal mole in much the same manner in which a uterine mole develops.

Intraperitoneal rupture in an ampullary pregnancy is not so frequent as in isthmal pregnancy, and when it does occur one

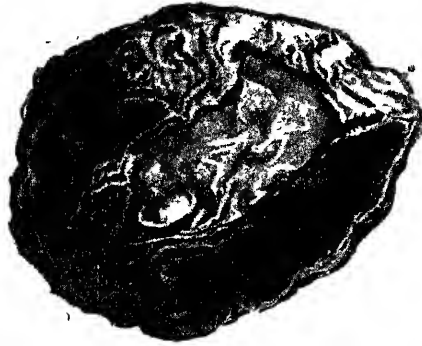


FIG. 78.—Mole formation in tubal gestation.

Note the presence of the embryo.

of the three terminations possible in intraperitoneal rupture of an isthmal pregnancy may result.

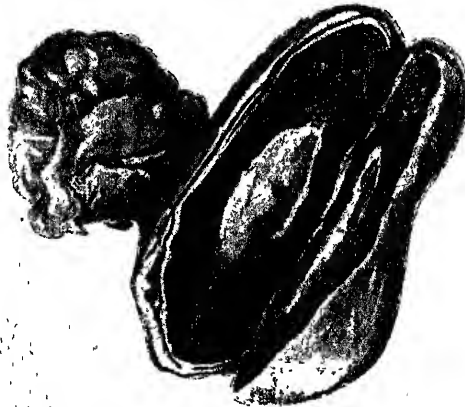


FIG. 79.—Section of a tubal mole.

Note the clear amniotic cavity.

D. Infundibular Pregnancy. This is merely one form of ampullary pregnancy where the ovum develops at the very end of the Fallopian tube near the fimbriated extremity. This is most likely to result in tubal abortion, or it may develop into a tubo-abdominal pregnancy and go on till the later weeks of pregnancy.

Secondary Pregnancy. A secondary pregnancy may be either:—

- (a) Secondary abdominal pregnancy, when the ovum after a primary tubal rupture develops in the abdominal

and becomes attached to the surrounding and omentum; or
 by ligamentous pregnancy when the ovum continues to develop between the layers of the broad ligament after a primary rupture of the tube.
 A pregnancy may proceed for some considerable time; it may go on to term when a spurious



FIG. 80.—Section of a tubal mole.

leading to rupture of the sac or death of the foetus by further changes.
Abdominal Pregnancy. As has been stated above, in the case of tubal gestation where rupture takes place, the placental implantation and the amniotic sac and the placental circulation may be sufficient to maintain a false sac forms all round which protects the foetus; the foetus grows inside the sac and continues for weeks, depending upon the nature of the sac. Finally, a secondary rupture takes place. The result of the rupture is death of the foetus, with either profuse hæmorrhage or a more localised form of hæmorrhage—a pelvic hæmatocele. If the patient survives, there are grave risks from the hæmorrhage and from the rupture. Should the patient survive, the dead foetus may be retained inside the sac for varying periods. Some amount of absorption takes place; later the hæmatocele may become infected and may result in abscess. If communication with the outside

is established, either *via* the rectum, abdominal wall, vaginal fornices or bladder, it discharges pus containing remnants of the foetal skeleton. In some cases of secondary abdominal pregnancy the gestation may go on to term and later spurious labour occurs. The labour pains do not, however, produce any dilatation of the cervix nor descent of the presenting part. If rupture does not take place at this stage after such a spurious labour the foetus dies, the liquor amnii is gradually absorbed and the abdominal enlargement decreases. The foetus may be retained in the abdomen for months or even years, and in some cases undergoes *mummification* or results in formation of a *lithopædion* if the foetus remains aseptic. If, however, infection occurs an abscess forms, which may later discharge through any of the four routes already mentioned. In such cases decomposed fragments of the foetal skeleton and soft structures will continue to be discharged for months.

Secondary Ligamentous Pregnancy. In these cases the rupture has taken place into the broad ligament. The commonest condition where such a contingency may arise is when the extra-uterine gestation is situated in the isthmial portion of the Fallopian tube. The result of the rupture, if it does not involve the placental site, is to open up the layers of the broad ligament and for the foetus with the amniotic sac intact to be extruded between these layers. The foetus may continue to grow and occasionally it has been stated that such cases have gone on nearly to full time. More frequently, however, after about the twentieth or twenty-fourth week of pregnancy secondary rupture takes place resulting in the death of the foetus with diffuse hæmorrhage, or rarely a more localised form of hæmorrhage, with the foetus surviving, resulting in what may be called a *tertiary abdominal pregnancy*.

The changes that may occur in a tertiary abdominal pregnancy are more or less the same as those possible in a secondary abdominal pregnancy.

Signs and Symptoms of Tubal Pregnancy. The signs and symptoms will depend very much upon the time at which the patient first comes under observation. Broadly speaking, three periods can be recognised:—

- (1) Before rupture of an extra-uterine gestation.
- (2) At the time of rupture or abortion.
- (3) After rupture or abortion:

- (a) Within a few days after rupture or abortion.
- (b) Two to three weeks or more after rupture or abortion.

(1) *Before Rupture.* There may be few symptoms. In fact, the first serious symptom to attract any attention may be at the time of rupture. Still, a careful investigation of the history of the case may reveal a few striking symptoms which should arrest the attention of the obstetrician or gynæcologist and force him to resort to a thorough pelvic examination. Among these symptoms are:—

(a) *History of Atypical Amenorrhœa.* The patient may have missed a period or even two, but the amenorrhœa is never typical of ordinary intra-uterine pregnancy. In between there may be repeated attacks of slight hæmorrhage, or occasionally there may be a continuous slight hæmorrhagic discharge. The discharge is not characteristic of a menstrual flow; the colour may be slightly changed to a reddish-brown, and if a careful examination be made of the discharge small pieces of the uterine decidua cast off may sometimes be noticed.

(b) Associated with this history of atypical amenorrhœa the patient may complain of irregular and intermittent pains of a colicky nature, referred generally to the lower part of the abdomen. These pains may be due either to the contractions of the uterus or occasionally to contractions of the musculature of the Fallopian tube. In some cases the pains are due to the peritoneal irritation set up by stretching of the tube due to increase of intratubal tension.

(c) The patient may complain of general malaise, occasionally morning sickness and a feeling of discomfort and uneasiness. As a rule there is no rise of temperature. In such cases a pelvic examination is most essential and gives the first definite indication of the abnormality.

On bimanual examination the following features may be noted:—

(1) The uterus is slightly enlarged, but generally not proportionate to the period of amenorrhœa.

(2) The early signs of pregnancy such as the softening of the cervix and Hegar's sign are not obvious. The uterus itself is not globular.

(3) A tender, unilateral, oval, pulsatile swelling on one side of the uterus, or occasionally in Douglas' pouch. This is the most important finding.

The actual location of the gestation in the tube may make some difference in the exact findings on a bimanual examination.

In an interstitial pregnancy the tumour is more or less continuous with the uterus, so that at one cornu of the uterus an

asymmetrical shape is produced. In such cases the tumour may be easily mistaken for a cornual pregnancy.

Where the gestation sac is in the isthmal portion, the tumour may be felt slightly separated from the uterus, while in ampullary and infundibular pregnancies a pedicle may be found connecting the swelling with the uterus. This pedicle is formed by the remainder of the tube and consequently a certain amount of mobility of the pulsatile tumour may be obtained.

As the ovum develops the uterus may be pushed to one side or other, and in some cases may be displaced backwards or tilted anteriorly, depending upon the position that the "tumour" occupies in one or other of the lateral fornices or in Douglas' pouch. Occasionally a slight blood-stained discharge may be present on the examining finger and in some cases, small granular particles of a reddish-brown character. Particular care should be taken in making a pelvic examination to avoid unnecessary force, as not infrequently cases have been reported where a



FIG. 81.—Ruptured tubal gestation of about 20 weeks.

Note the hand and foot in the sac.

somewhat rough examination has resulted in rupture actually taking place on the examination table.

(2) *At the Time of Rupture or Abortion.* The symptoms consequent on rupture or abortion differ in some important respects. When *rupture* takes place the symptoms are of a more grave nature than in the case of tubal abortion. The chief signs and symptoms of rupture are those due to shock and hæmorrhage. The pain is so intense that the patient may faint. The pain is of a stabbing nature and is more severe with rupture than with abortion. The severity and the duration of the pain will depend upon the nature of the rupture and the extent of the peritoneal irritation

set up. In some cases the pain may gradually subside; in others the pain may be intermittent or continuous. Associated with the pain is collapse due to intraperitoneal or subperitoneal hæmorrhage. The loss of blood may be so great that the patient is blanched, has a rapid and thready pulse and the temperature becomes subnormal; there may be extreme restlessness, "air hunger," an anxious expression, the respirations becoming rapid and shallow, till in some cases if assistance is not promptly available a dangerous amount of collapse develops, finally ending in death. The abdomen is tender, becomes distended and a certain

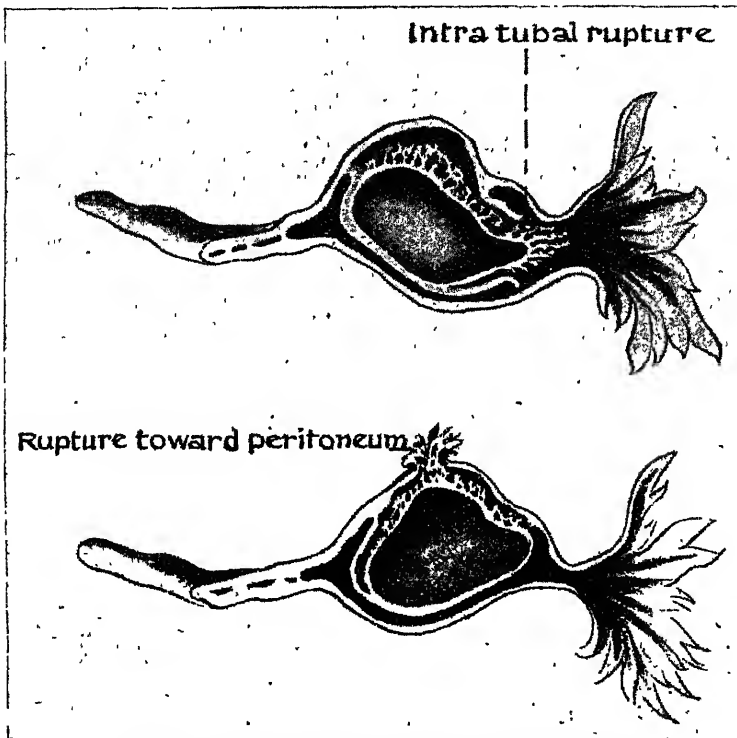


FIG. 82.—Rupture of an ectopic in the ampulla.

amount of fullness may be felt in the flanks. A sign that may be present is shifting dullness; but this is not easily ascertainable, nor is it desirable to move the patient about to elicit this sign. A bimanual examination of the patient at this time may not reveal any definite signs beyond extreme tenderness in the fornices, especially if the rupture has taken place before the twelfth week of pregnancy. In cases of diffuse intraperitoneal hæmorrhage no

fullness or resistance may be felt in the fornices. It is not easy in view of the pain and the collapsed condition of the patient to make a bimanual examination with any detail, nor is it advisable in such cases to attempt to do so by pressing on the abdominal wall. Occasionally, if the patient is seen a few hours after rupture and there has been time for the blood to coagulate, it is possible that a soft boggy swelling, slightly pitting on pressure, may be felt in one or other of the fornices or in Douglas' pouch.

In cases of diffuse subperitoneal hæmorrhage the symptoms will be more or less similar to those of diffuse intraperitoneal hæmorrhage, but in addition there will be pressure symptoms due to the presence of blood beneath the pelvic peritoneum. Pain may be much greater owing to the stretching of the peritoneum and the shock is proportionately increased. If a broad ligament hæmatoma forms the symptoms are usually much less severe, and in some of these cases the patient after an attack of sudden pain followed by slight faintness may rally round sufficiently not to take serious note of her condition.

The symptoms of *tubal abortion* are slightly different from those of a tubal rupture. The pain is not of the same excruciating nature, but is more intermittent and prolonged. The shock is not severe as there is no rupture of a viscus, and the signs of collapse will set in more gradually as the leakage of the blood continues. The extent of the hæmorrhage is less than in either intraperitoneal or subperitoneal hæmorrhage, so that the hæmorrhagic collapse following tubal abortion is not so severe as in cases of rupture. Simultaneously with the changes that take place in the tube, contractions of the uterus may occur, resulting in a slight amount of hæmorrhage *per vaginam*, with the extrusion of a decidual cast, either entire or piecemeal. The amount of external bleeding is relatively small and never proportionate to the degree of collapse and may continue for a few days. On the other hand, in fulminant cases of intraperitoneal rupture, there may be no bleeding *per vaginam*. The passage of a decidual cast is pathognomonic of extra-uterine gestation. In our experience a complete decidual cast, which is a triangular shaped membranous sac, smooth in its interior and shaggy outside, with three openings corresponding to those of the two Fallopian tubes laterally and the internal os below, is very rarely met with. It is much more frequent, however, in cases of tubal abortion, and it may be said with some confidence that if a complete decidual cast is expelled the diagnosis of tubal abortion will be far more frequently correct than that of tubal rupture. In some cases where periodic attacks of pain occur following slight rupture or repeated attempts at tubal

abortion, the decidual cast may be passed in bits mixed with the blood.

In cases of tubal abortion a bimanual examination may possibly reveal the presence of a mass to one side of the uterus. This is a hæmatocele which forms generally in Douglas' pouch, and it may be present more or less as a crescentic swelling extending from one lateral fornix to the other behind the uterus. The mass may in some cases be continuous with the tube of the affected side. The uterus is generally displaced by the hæmatocele and it may be pushed to one side or forwards; pulsation may occasionally be felt in this mass, but the typical unilateral pulsation may not be quite so obvious when tubal abortion has taken place.



FIG. 83.—Ectopic gestation.

- A. Tubal abortion showing the ovum being extruded.
- B. Decidual cast expelled in the same case.

(3) *After Rupture of the Gestation Sac.* We prefer to consider the condition of the patient at two different periods,

(a) *Within a few days after rupture of the gestation sac.* The history of the case is important, and if a good history is elicited it will put the obstetrician on guard as to the possibility of a ruptured tubal gestation having occurred previously. At this stage the patient may complain of a dull aching pain in the pelvis, associated with some difficulty in micturition or defecation. There may be general malaise, occasional vomiting and sometimes attacks of faintness. Irritation of the rectum with tenesmus may also be complained of; elevation of temperature may also be present and the patient may complain of slight vaginal bleeding. In some cases a sudden attack of severe pain may recur followed by symptoms of severe collapse. Gradually the swelling in the pelvis increases in size and may be felt on abdominal palpation. A more or less severe grade of anæmia may result. A hæmatological examination will reveal the presence of a leucocytosis with a diminution in the number of red cells and total hæmoglobin content. A vaginal examination will show the presence of a tender, soft swelling filling the pouch of Douglas and extending to the lateral fornices. The swelling pits on pressure, is painful and tender and may be mistaken for an inflammatory swelling or a pelvic abscess.

(b) *Two to Three Weeks after Rupture.* Besides the characteristic history that may sometimes be elicited in such cases the patient complains of a chronic, dull aching pain in the lower part of the abdomen and pelvis and a certain amount of fullness in that region, with difficulty in micturition and defecation. The discharge of blood *per vaginam* may have stopped by this time, but the other symptoms referable to chronic peritoneal irritation may still be present, together with general malaise, languor, a slight elevation of temperature, loss of appetite and occasional attacks of vomiting. The patient may be definitely anæmic and may complain of general debility.

A bimanual examination in these cases will reveal the presence of a somewhat resistant mass filling the whole of Douglas' pouch, which does not easily pit on pressure, and may therefore be mistaken for an inflammatory swelling. The uterus is incorporated in this swelling; neither can the tubes and ovaries be palpated separately. If these cases are left untreated the temperature may gradually settle down and the patient more or less recover, but there will be a permanent amount of induration in the pelvis which may lead to chronic pelvic pain associated occasionally with menorrhagia and metrorrhagia. In other cases the swelling may become infected and an abscess forms with elevation of temperature, attacks of shivering and a rise in pulse-rate with exacerba-

tions of pelvic pain. Later the abscess may point at one of the situations already mentioned and discharge pus, with some relief of symptoms but leaving a sinus behind.

Signs and Symptoms of Abdominal Pregnancy. Primary abdominal pregnancy is extremely rare. A few cases have been recorded in the literature, but care is required in discriminating between primary and secondary pregnancy.

Secondary abdominal pregnancy, on the other hand, is a well-recognised condition that occurs as a sequel to primary rupture of a tubal gestation. Tertiary abdominal pregnancy has been known to occur in cases of rupture of an intraligamentous pregnancy following a primary tubal rupture. In cases of abdominal pregnancy the foetus may develop to full term and a spurious labour occurs with intraperitoneal hæmorrhage and death of the foetus. The hæmorrhage may be so severe as to cause grave collapse. In some conditions, however, the hæmorrhage may be very limited and a dead foetus remains in the abdomen for months or even years. When the foetus dies in a secondary abdominal pregnancy it may undergo maceration, adipocere formation, mummification, formation of a lithopædion or suppuration. In the majority of cases, no special symptoms may be noted in a secondary abdominal pregnancy and the patient may not be conscious of the fact that anything is wrong till she comes to full term. The movements of the foetus can be felt with much greater ease and the foetal parts may be palpable more superficially than would ordinarily be the case in a uterine gestation. In some cases the history may be very suggestive. It will reveal the fact that the patient in the early weeks of pregnancy had experienced sudden severe abdominal pain and other symptoms characteristic of primary rupture. As the pregnancy continues the patient may feel uncomfortable and complain occasionally of pain in the abdomen, obstinate constipation, general malaise and occasionally jaundice with slight elevation of temperature and signs suggestive of toxic absorption. On careful bimanual examination suspicion may first be aroused from the following findings: the cervix is not soft and may often be displaced from its normal position, and in rare cases the body of the uterus may be felt as a distinct mass, separate from the gestation sac. A rectal examination may be of use in confirming the findings of a vaginal examination. A skiagram may sometimes be of help, as often in cases of secondary abdominal pregnancy anomalies of foetal development may be noted, also the fact that the foetus occupies a position far away from the pelvic brim and even the false pelvis, which is not the case in a normal pregnancy,

Diagnosis. The diagnosis of an extra-uterine gestation at its various stages depends upon a careful consideration of the several signs and symptoms already referred to.

Before Rupture. It may be mistaken for chronic salpingitis, ovarian cyst, fibroids, inflammatory conditions of the pelvic cellular tissue, or an angular pregnancy. The points to be taken into consideration in the differential diagnosis of this condition are:—

(1) The presence of symptoms of pregnancy with an irregular type of menstrual history.

(2) Alterations in the shape and size of the uterus.

(a) The uterus is enlarged but not proportionate to the period of pregnancy.

(b) It is not globular in shape but more or less preserves the pear shape of the unimpregnated uterus.

(c) The softening of the cervix is only slightly marked.

(d) The softening of the lower uterine segment (Hegar's sign) is absent.

(3) Palpation of a unilateral pulsatile swelling, which is painful and tender and to one side of the uterus.

The number of occasions when mistakes in diagnosis have been made, shows the difficulty of diagnosing the condition correctly. It is safer to operate on all doubtful cases.

At the Time of Rupture. At this stage the differential diagnosis rests between a uterine abortion or any acute abdominal condition such as perforation of a gastric or duodenal ulcer, appendicular colic, renal colic, or a twisted ovarian cyst. Occasionally a uterine abortion may occur in association with any of these conditions, and in such cases it is only by a careful examination of the patient and by noting all that has been expelled from the uterus, that a diagnosis is possible. The history of the case, the sudden colicky pain, with signs of severe internal hæmorrhage, the expulsion of a decidual cast, the occurrence of slight uterine bleeding—all these signs must put one on guard. Where there is any doubt with regard to the diagnosis it is better to anaesthetise the patient and make a thorough examination, and be prepared for immediate operation, if necessary.

A *retroverted gravid uterus* is occasionally confused with a ruptured ectopic gestation of some duration. It is very important to diagnose this condition, as the method of treatment is entirely different and any error in diagnosis may lead to serious consequences. To differentiate between these two conditions the points to be noted are:—

- (1) History of amenorrhœa ; this is typical in a retroverted gravid uterus, but atypical in an ectopic gestation.
- (2) The pain and hæmorrhage are both severe in a ruptured ectopic, while in a retroverted gravid uterus there is little or no hæmorrhage and the pain, except in the very late stages, is never acute.
- (3) Urinary symptoms are more frequent in a retroverted gravid uterus, whereas in an ectopic they are not quite so common till some time has elapsed after the rupture.
- (4) A bimanual examination is of great importance. The position of the cervix and the direction of the cervical canal ought to be noted, and it will be found that in a retroverted gravid uterus the cervix is generally displaced upwards, sometimes almost underneath the symphysis pubis, and that the cervical os is pointing forwards ; the fundus is felt posteriorly. In an ectopic gestation, on the other hand, the cervix may be pushed up or to one side ; but the cervical canal is pointing in a more or less normal direction and a soft mass which may be pulsatile is to be felt in Douglas' pouch and more laterally. In cases of doubt it is always well to pass a hypodermic needle with syringe, through the soft swelling in Douglas' pouch, when on withdrawing the piston a certain amount of blood or serosanguineous fluid may be drawn into the syringe. This would almost conclusively prove that it is a case of ruptured extra-uterine pregnancy.

Twisting of an ovarian cyst gives rise to severe pain and signs of shock. But the history of atypical amenorrhœa is not generally present, and in the majority of cases a bimanual examination will reveal the presence of the cervix and the body of the uterus in more or less their normal position, while the twisted cyst will probably be much higher. There is no vaginal bleeding nor is a decidual cast passed *per vaginam*.

A very rare complication was once met with, where with an intra-uterine pregnancy of twelve weeks' duration the patient was admitted with severe signs of shock and collapse. On opening the abdomen it was found that a very much enlarged spleen, the result of chronic malaria, had undergone torsion and the intense congestion had led to hæmorrhage into the peritoneal cavity. Further, this twisted enlarged spleen with the long pedicle was partially

lying in Douglas' pouch. A splenectomy was performed, the patient made an uneventful recovery, the uterine pregnancy went on to full term and delivery of a live child occurred spontaneously.

Appendicular Colic, Renal Colic, Biliary Colic, the Condition associated with Perforation of a Gastric or Duodenal Ulcer. These conditions cause signs and symptoms peculiar to the particular condition and the previous history is also of value in differentiating them.

When the patient seeks advice some weeks after rupture the signs of a pelvic hæmatocele will generally be present. A mass is found filling the whole of Douglas' pouch, and in some cases pulsations may still be felt. The definite outline of the uterus may not be made out; the patient often complains of difficulty with micturition and defecation. It is not uncommon in such cases to mistake this for an inflammatory swelling, or *per contra*, an inflammatory swelling of the tubes associated with pelvic cellulitis may not infrequently be mistaken for an old ruptured extra-uterine gestation. The history, if carefully elicited, may be of some value. Passing a needle through Douglas' pouch may sometimes reveal the presence of old blood-clot. We would deprecate any attempt at a posterior colpotomy, as it may give rise to subsequent infection of the mass in the pelvis. If, however, one is prepared to open the abdomen straightaway, a posterior colpotomy may be done with care in suitable cases for purposes of diagnosis.

The diagnosis of secondary abdominal pregnancy is a matter of considerable difficulty. Not till labour pains have set in may the suspicion arise that it is possibly a case of secondary abdominal pregnancy. If the patient is suffering from any signs suggestive of toxæmia and the foetal movements are felt very easily and the foetal parts palpated superficially, a careful history should be elicited and a skiagram should always be taken. If a sound is passed with care into the uterus, it at once shows that the uterus is enlarged to a minor degree and is obviously not pregnant. This should be done only if immediate laparotomy is possible.

Prognosis. The prognosis in this condition depends upon several factors, of which the following are important :—

- (1) The time at which the diagnosis is first made.
- (2) The age of gestation.
- (3) The seat of gestation.
- (4) The particular termination of the gestation—whether rupture, abortion or mole formation.
- (5) The secondary changes that have taken place.

The danger is at its maximum at the time of rupture, and if prompt surgical aid is not available the condition is very grave. If a mistake is made in diagnosis or prompt surgical aid is not given in time, the condition may likewise prove a serious one.

While the prognosis should at all times be guarded with proper and immediate treatment, there is no doubt that very many gravely ill cases respond satisfactorily. In the majority of cases surgical treatment is the only possible method of saving the mother.

The prognosis so far as the foetus is concerned does not arise where death of the ovum occurs in the early months. In those very rare cases where the foetus continues to develop till term is reached, it must be borne in mind that fully 50 per cent. of the foetuses are deformed, and the risks incidental to the mother are so great in trying to save the foetus that it is a question whether the child's life should be considered seriously.

Treatment The treatment of this condition depends upon the stage at which the woman seeks assistance. Broadly speaking, a woman may seek aid—

- (1) Before rupture of the ectopic sac when the patient complains of indifferent health, with occasional attacks of colicky pains and the examination reveals the presence of an intact tubal gestation.
- (2) The patient is seen at the time of rupture, when she is suddenly seized with severe abdominal pain and profound collapse.
- (3) The patient has had for some time abdominal pain with a more or less slight continuous bleeding *per vaginam*.
- (4) The woman is seen with a dull aching pain in the lower part of the abdomen and has difficulty with micturition and defecation.
- (5) The woman is in the later months of pregnancy with signs suggestive of some toxic absorption, where the ectopic has advanced as an abdominal pregnancy to the thirty-second to fortieth week.
- (6) The woman comes with symptoms of discomfort, pain in the abdomen, general malaise and incidentally it is discovered that she has got a dead foetus in an extra-uterine sac.
- (7) The woman comes with signs of infection—either a pelvic abscess or a chronic sinus discharging remnants of the foetal skeleton.

(1) *Before Rupture of an Ectopic Gestation.* In those fortunate cases where the nature of the complaint necessitates a bimanual examination and the obstetrician finds even a reasonable suspicion of an unruptured ectopic gestation, we cannot too strongly commend the necessity for an immediate laparotomy. At this stage the prognosis is good if the condition is treated promptly. It can never with any degree of certainty be forecasted when an "explosion" will occur which may lead to a fatal or almost fatal collapse of the patient. The operation is simple and consists in removing the diseased tube with the ovum.

The question has been raised whether in cases of tubal gestation on one side, the other tube should not be simultaneously removed to prevent the possibility of an extra-uterine gestation occurring on that side later. As this is infrequent, it seems unnecessary to sacrifice an apparently healthy tube. On the other hand, it has been argued that a conservative line of operative treatment is desirable. In such cases it is recommended to perform a salpingotomy, remove the ovum and leave the tube behind, or a partial salpingectomy may be performed and the remnant of the tube made patent and left *in situ*. Cases have been recorded where, after such a conservative operation, uterine pregnancy has occurred. But in some cases recorded in the literature, and within our experience, an ectopic gestation has recurred in the remnant of the tube left behind. A policy between these two extremes seems desirable, and we are content with leaving the unaffected tube and removing the diseased one entire in cases of unruptured ectopic gestation.

(2) *Patient is seen in a Condition of Collapse with a Sudden Attack of Severe Pain.* In this case the causative factor may be a rupture of an extra-uterine gestation or occasionally a tubal abortion. In the fulminant type of cases where the collapse is extreme and the pain intense, rupture has occurred. The extent of the hæmorrhage depends upon the seat of the rupture, being more in isthmal and interstitial pregnancies than in the ampullary type.

The question that arises under such circumstances is, when should the operation be performed? Is it justifiable to wait in the hope that the patient may rally from shock and collapse? We hold that an immediate operation is the best procedure. So long as the patient is not operated upon there is little chance of her improving, since the hæmorrhage continues from the ruptured sac and the patient loses more and more blood, so that her condition gradually becomes worse. While steps are taken to rally the

patient, the operation should be done preferably under a local anæsthetic.

After carrying out the usual preliminary procedures the abdomen is opened by a subumbilical median incision. As soon as the abdominal cavity is opened blood wells up. Little or no time should be wasted in trying to mop up the blood, and the best method of controlling the hæmorrhage at this stage is to dip the hand into the pelvis, feel for the uterus and then laterally for the adnexa, and locating the diseased tube lift it upwards by the fingers and apply two clamps, one to the infundibulo-pelvic ligament beyond the ruptured tube and another to the uterine end of the tube. This arrests further bleeding and the surgeon can now proceed to mop the abdomen free of the fluid blood. Where hæmorrhage has been recent and a good deal of fluid blood is available it can be mopped up by a sponge and then squeezed into a sterilised solution of 2 per. cent. sodium citrate. The citrated blood is returned to the patient intravenously after filtering it through layers of sterilised fine muslin. This is termed *autohæmo-transfusion* and, in our experience, the patient has been found to respond with promptness after such transfusion. After clamping the tube at either end the tubal sac is removed. The ovary is conserved if this is possible and it is in a healthy condition. The cut ends of the tube are secured by ligatures and the two edges are brought together so as to re-form the broad ligament. As far as possible all the blood and any clots in Douglas' pouch and in other parts of the abdominal cavity are mopped out. The other tube should also be examined, as occasionally in such cases it is the seat of a hæmatosalpinx. The exact cause for the formation of the hæmatosalpinx is not known. It is a matter for serious consideration whether this tube should also be removed; unless the tube is diseased there does not seem to be any justification.

It is important to emphasise the fact that as little time should be spent as possible in the general toilette of the abdomen. The abdomen is then closed in layers and the patient removed to bed, where further treatment for collapse is continued. The sooner the operation is done after a primary rupture the greater are the patient's chances of survival.

Even in those fulminant cases where apparently the woman appears to be *in extremis*, the pulse ranging from 140 to 152, it is our experience that an immediate operation with simultaneous treatment for collapse has proved successful.

The alternative of waiting and watching in the vain hope that the patient may rally is invariably, or almost invariably, fatal.

In some cases where a tubal abortion is the cause of the sudden attack of pain and collapse, the same treatment as has been described above is to be adopted

(3) *Patient has had for some time Abdominal Pain, with a more or less Slight Continuous Bleeding.* Such cases require careful consideration. While we do admit that an immediate operation, as in the fulminant cases of rupture or abortion, may not be necessary, it must be clearly realised that the condition is a potential danger as a second rupture may take place at any time, or further hæmorrhage of an alarming nature may occur at a time when the patient cannot be attended to immediately. Further, a fresh attack of hæmorrhage of a severe nature in a patient who has already been exsanguinated renders the prognosis so much more grave that it is well to operate as early as possible.

The operation is on the same lines as that adopted at the time of rupture; In these cases it will often be found that a good deal of blood-clot is present in the pelvis and the lower abdomen and that the intestines, omentum, tubes and uterus have become adherent. The patient should be prepared for an abdominal section, the abdomen should be opened, and with care the uterus and adnexa freed from the adhesions and the diseased tube should be removed.

(4) *The woman is seen with a Dull Aching Pain in the Abdomen, with Difficulty in Micturition and Defecation.* These are cases where a pelvic hæmatocele has been present for some time and is causing pressure on the urethra and rectum and thus producing difficulty with micturition and defecation.

Two methods of treatment are available for this condition: the expectant method and the operative method.

The *expectant method* consists in absolute rest in bed, hot fomentations, vaginal douches, ichthyol and glycerine tampons and the administration of general tonics. These are done with a view to favour absorption of the blood-clot as far as possible. This is not, however, a method to be commended for two reasons: firstly, the absorption is never complete and generally leaves a certain amount of chronic adhesive plastic peritonitis which later may give rise to trouble, besides seriously interfering with the proper functions of the genitalia. Secondly, it can never be predicted whether a pelvic hæmatocele may not suppurate and so give rise to further complications. It is therefore very much to be preferred—except in those rare cases where the patient absolutely refuses the operation or other complications are present which contraindicate any operative procedure—that an operation be performed.

As regards the *operative method* two courses are open: the pelvic hæmatocele may be dealt with either by the abdominal route or the vaginal route. We very much prefer and have always practised the abdominal route for this purpose, except in those rare cases where the hæmatocele is already infected. The advantage of the abdominal route is that the clots can be removed completely and opportunity taken to examine the adnexa, to remove the diseased tube, to free the structures from adhesions and bring the uterus into position, suspending it if necessary to prevent its becoming displaced again.

By using the vaginal route blood-clot is removed without entering into the general peritoneal cavity, but it must be remembered that occasionally this method may itself favour infection if the vagina is already infected. The other disadvantage that the adnexa and the uterus cannot be properly treated is obvious. Where, however, the pelvic hæmatocele is already infected, it is not desirable to open up the general peritoneal cavity and hence posterior colpotomy is preferable.

(5) and (6). *Abdominal Pregnancy.* This is a very serious condition and there is considerable difficulty in deciding as to the best method of treatment. The first thing to be recognised is whether the child is alive or not. If the child is alive, there is free circulation of blood through the placental sinuses; the main problem for the operator under these circumstances is how effectively to control the bleeding after separation of the placenta. On the other hand, when the foetus has been dead for some time the placental sinuses gradually shrink. Consequently the hæmorrhage that is likely to be encountered from the separation of the placenta will be much less, so that it would appear that from the point of view of the mother it is safer for an operation to be done after the child is dead. One cannot, however, prognosticate with any degree of certainty whether and when a rupture might not take place at any time during the course of pregnancy when the foetus is alive. The effect of a rupture will be such a severe loss of blood that the patient may be *in extremis* before any assistance is available. The problem thus is a delicate one and conflicting considerations have to be borne in mind in selecting the safest method of treatment.

The ideal treatment is to remove the foetus and the entire sac, so that the child may be delivered alive and the whole of the after-birth may be effectively removed without any damage to the mother. We have already stated that the child is very often deformed in these cases, and if the condition is met with before full term it does not seem to be justifiable to delay the operation with a view to prolong the life of the foetus intra-abdominally. What,

then, is the best method of treatment? This is best discussed under the two headings: (a) When the foetus is alive and (b) when it is dead.

(a) *When the Foetus is alive.* An abdominal incision is made and the foetus removed. The question of dealing with the placenta is then the most important point for consideration. It will depend upon the situation of the placenta and how far it is possible effectively to control the hæmorrhage by ligating the vessels communicating with the placenta. It is advisable in some of these cases to ligate the ovarian and uterine vessels and thus diminish the arterial blood supply before proceeding to the separation of the placenta. Where, however, the placenta is attached partially to the broad ligament and the omentum and these can be clamped effectively, the placenta can be removed entire and the stumps controlled by ligature. It may sometimes occur that the placenta is so situated that it is inadvisable to separate it. Under these circumstances the best course is to cut the umbilical cord as short as possible and marsupialise the placenta by stitching the sac wall to the abdominal parietes, thereafter packing the cavity with gauze. The gauze is removed periodically, and when the vascular supply has gradually diminished the dead placenta easily separates itself and finds its way out through the abdominal opening. Generally ten to twelve days after marsupialisation the placenta can be safely removed, but it is not desirable to leave it much longer as it may tend to become secondarily infected. Occasionally, it may be safer to leave the placenta alone after cutting the cord short and close the abdomen.

(b) *Where the child is dead.* If the child has been dead for some time the chances are that the blood supply to the placental site is considerably diminished and one is dealing with a dead placenta, so that its separation does not lead to much hæmorrhage. After a laparotomy the foetus can be removed as well as the placenta. If the placenta is badly adherent it is desirable not to be too meticulous about removing every piece of it, as thereby important structures such as the intestines may be badly damaged and considerable trouble may be experienced in controlling hæmorrhage. The small bits of placenta are generally absorbed for the most part, or at least they do not give rise to further complications, and recovery of the patient is more or less uneventful.

(7) *When the woman comes with signs of infection.* Where the gravid sac is infected the condition is attended with grave risks. If the sac cannot be removed entire, or if the infection has already spread to the surrounding structures and an abscess is pointing, or has actually burst through one or other of the

surrounding structures, the most conservative method of treatment should be adopted. If, however, the contents cannot be reached through the vaginal route the abdomen may have to be opened into at a place where there is the least possible risk of infection spreading to the general peritoneal cavity and where effective drainage can be secured. It is better not to attempt a too vigorous treatment with a view to remove the whole of the contents, but to allow it to drain continuously and thus evacuate itself.

Pregnancy in a Uterine Horn. One type of uterine malformation is where a small vestigial sac is present which sometimes communicates with the main cavity. Occasionally the fertilised ovum migrates into this sac and develops there and causes the same difficulties that are met with in cases of tubal gestation. The development of the ovum in the rudimentary horn is associated with the formation of a false decidua in the uterine cavity proper. The uterus increases in size. As the muscular tissue of the rudimentary horn is poorly developed and cannot keep pace with the progressively enlarging ovum, rupture takes place. This may occur at any time within the first sixteen weeks of pregnancy.

It is difficult to diagnose this condition with any degree of certainty. When the pulsating tumour corresponding in size to the duration of pregnancy is detected alongside the slightly enlarged uterus, suspicion may be roused as to the possibility of pregnancy in a rudimentary horn. Before operation it is almost impossible to differentiate from the more common tubal gestation. The round ligament, if felt, is the landmark in the differential diagnosis. This ligament is external to the gestation sac when the pregnancy is in a rudimentary horn, while in tubal gestation it is on the mesial side. More often the diagnosis is made at laparotomy again by recognising the position of the round ligament with reference to the gestation sac, whether it be intact or ruptured.

Treatment. The only thing to do is to remove the pregnant horn of the uterus, conserving the main cavity of the uterus if possible. In cases, however, where the horn has developed sufficiently to distort the main cavity, or where bleeding cannot be controlled, it may be necessary to perform a hysterectomy.

REPEATED EXTRA-UTERINE PREGNANCIES

Not infrequently a woman who has had an extra-uterine pregnancy once may have an extra-uterine on the other side. Such cases are on record and are within our own experience. In one case the patient had three consecutive extra-uterine pregnancies, one on each side and the third in the stump of a tube remaining

after a previous partial salpingectomy which had been performed for an extra-uterine gestation.

COMBINED EXTRA-UTERINE AND INTRA-UTERINE PREGNANCIES

A tubal gestation is sometimes associated with an intra-uterine pregnancy. Such cases are rare, but are attended with considerable risks.

Twins and triplets have been met with in an extra-uterine sac.



FIG. 84.—Extra-uterine pregnancy showing twins.

The occurrence of a vesicular mole in an extra-uterine gestation is exceedingly rare, but a case has been described. The danger in such a case is obvious.

CHAPTER XXIV

HÆMORRHAGES IN THE THIRD TRIMESTER OF PREGNANCY AND FIRST TWO STAGES OF LABOUR

THERE are several causes of vaginal hæmorrhage in the last weeks of pregnancy, but the most common of them all is premature separation of the placenta. A pregnant woman may also bleed from causes which may give rise to hæmorrhage in a non-gravid woman, such as cancer of the cervix, a fibroid or a mucous polypus of the cervix, erosion of the cervix, a cervical varix, or from trauma, the result of a fall or an accident producing lacérations of the vaginal canal or cervix. Apart from these accidental factors, the main cause is the separation of either a normally or an abnormally situated placenta. The placenta is in the large majority of cases situated in the upper uterine segment or zone of contraction, usually near the fundus on the posterior wall of the uterus and less frequently on the anterior wall. The placenta may in some cases be situated wholly or partially in the lower uterine segment or zone of dilatation. When hæmorrhage occurs as a result of the separation of a normally situated placenta—that is, in the zone of contraction or upper uterine segment—the condition is spoken of as accidental hæmorrhage or *abruptio placentæ*, as in the large majority of cases the hæmorrhage is accidental, although there may be some underlying pathological factor. An abnormally situated placenta is spoken of as a *placenta prævia*, and hæmorrhage from it is termed unavoidable hæmorrhage. Owing to the situation of the placenta its separation and consequent hæmorrhages are inevitable when the lower uterine segment dilates during labour.

Abruptio Placentæ

This condition is met with fairly frequently, and in some cases it is responsible for the death and extrusion of the ovum in the earlier periods of pregnancy as well. At the Government Hospital for Women and Children, Madras, there were 200 cases of *abruptio placentæ* in 20,420 confinements during a period of six years, giving an incidence of 1 in 102 cases.

Ætiology. There are two principal causative factors underlying this condition:—

- (1) Toxæmias of pregnancy; and
- (2) Diseases of the endometrium and the ovum,

In the majority of the severe cases of *abruptio placentæ* some signs will be noted, such as the presence of albumin in the urine, a high blood pressure as well as subjective symptoms usually suggestive of toxæmia. In some cases of severe toxæmia, it has been noticed that patients either develop eclampsia or manifest signs and symptoms of *abruptio placentæ*.

Endometritis, degeneration of the decidua, arteriosclerosis syphilitic changes pertaining to the vessels and metritis may all produce changes in the placenta as well as in the endometrium leading to a premature separation of the placenta.

The immediate cause of the hæmorrhage may often be trauma, as from a sudden fall, a blow or kick on the abdomen, severe jolting, as in an automobile journey, or during coitus. Occasionally separation of the placenta may be caused by factors which arise during the course of labour, such as :—

- (1) The sudden emptying of the uterus in cases of pronounced hydramnios.
- (2) Precipitate labour.
- (3) A short or a relatively short cord, or a cord round the neck pulling on the placenta.
- (4) In delivery of twins.
- (5) In attempts at version and breech extraction.

Varieties. Clinically cases of *abruptio placentæ* are divisible into three kinds—mild, moderate and fulminant.

In *mild* cases of accidental hæmorrhage there may be a certain amount of external bleeding which occurs during the course of labour with fairly good uterine contractions, delivery being completed spontaneously. In these cases the only evidence of this condition may be external bleeding prior to delivery, or the presence of one or more retroplacental clots passed with the expulsion of the placenta.

In the *moderate* cases of accidental hæmorrhage signs of bleeding, internal or external, are manifest and occasionally the life of the foetus may be endangered. But the uterus is able to contract and in the large majority of cases labour terminates spontaneously or with slight assistance.

In cases of the *fulminant* type, which are mostly of the concealed variety, the onset is sudden and accompanied by severe pain.

and signs of shock and hæmorrhagic collapse. These are the most fatal forms of *abruptio placentæ* and they invariably lead to death of the fœtus and seriously endanger the life of the mother.

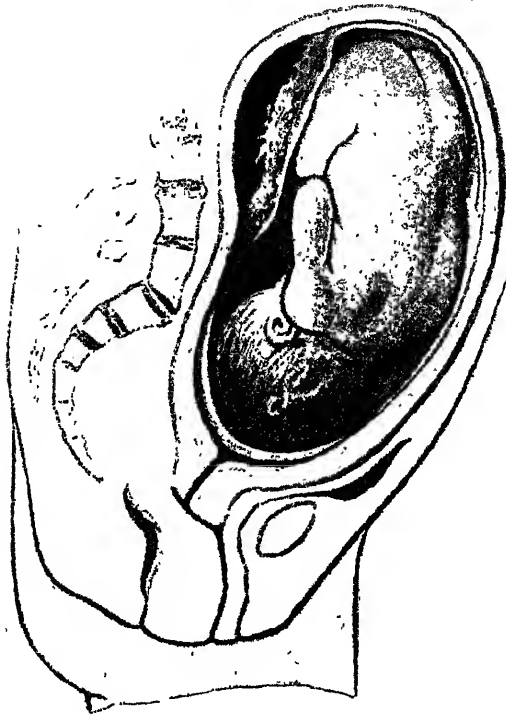


FIG. 85.—Abruptio Placentæ.

Note the hæmorrhage into the amniotic cavity.

Pathology. The hæmorrhage that occurs in *abruptio placentæ* is from the placental sinuses, and as the sinuses remain open and no clot formation takes place the bleeding continues. From the pathological point of view, they are divided into three kinds:—

(1) Revealed; (2) Concealed; (3) Mixed.

When the blood escapes through the vaginal canal, it is called Revealed Hæmorrhage. When the bleeding occurs by separation of Placenta, but is not visible outside, it is known as concealed variety. The blood, in the concealed variety may collect in one of the following situations:—

- (1) Behind the placenta, as a large retroplacental clot.
- (2) Between the membranes and the uterine wall, separating both the placenta and the membranes from the uterine wall.

- (3) In the amniotic cavity, the blood finds its way out by a tear through the membranes.
- (4) Behind the presenting part, as in cephalopelvic disproportion when the head is fixed.
- (5) Occasionally the blood may extravasate into the muscular tissue of the uterine wall, its way through the Fallopian tubes into the peritoneal cavity.

Whether the blood ultimately escapes outside or not depends upon the condition of the uterine musculature and power of contraction. If the normal tone of the uterus is not impaired it will contract when the blood escapes from the placental sinuses and thereby force it outside. In some cases blood may from the very start find its way out through the membranes and through the partially dilated cervix. In cases where the uterine musculature itself is extensively diseased at the onset of pregnancy, its tone is completely lost, so that it does not contract within the uterine cavity and may distend it enormously. Intra-uterine hæmorrhage may occur without any external signs. The mildest cases, which are the most common, are the so-called concealed hæmorrhage. In the most severe hæmorrhage first tends to collect inside the uterus. As the tone of the uterine musculature does not allow it to be distended beyond a certain limit, contractions are provoked and the hæmorrhage at a later stage becomes externally revealed. These are the cases grouped in the category of accidental hæmorrhage.

The extensively diseased condition of the uterus allows the hæmorrhage to continue and distend the uterus so that a great amount of blood is lost and the patient perishes internally to death without any of the blood finding its way out. Clinically, these are the fulminant type of cases. The loss of tone of the uterine musculature is due to the separation between the muscular fibres. It is thus not in a position to contract and labour does not occur owing to the overstretching of the musculature.

Clinical features. These depend upon the variety of case. *Mild Cases.* In these cases the patient may complain of pain and occasionally there is tenderness over the abdomen accompanied with some loss of blood externally. Labour is usually not prolonged and generally terminates spontaneously. Where external signs are not present the condition is diagnosed only by the presence of dark blood-clots with the placenta after delivery of the child.

dark blood-clots are always suggestive of antepartum hæmorrhage due to partial separation of a normally situated placenta.

Moderate Cases. Here the patient may be seized with some degree of pain, generally referable to the fundal portion of the uterus, accompanied by signs of slight hæmorrhagic collapse. The pulse-rate may increase and its volume and tension may also be affected. The severity of the symptoms depends upon the amount of blood loss and the accompanying shock. The foetal heart may be audible or intra-uterine death of the foetus may occur and the foetal movements may therefore not be felt.

In the mild and moderate degrees of *abruptio placentæ* the physical signs may not be much in evidence. Hæmorrhage externally may be the first sign. The uterus may be a little more enlarged, somewhat tense, painful and tender. Foetal parts may not be easily palpable in the moderate cases of accidental hæmorrhage and the foetal heart may or may not be audible, depending upon the extent of separation of the placenta.

In every case of external bleeding, or where there are signs and symptoms of hæmorrhagic loss in a pregnant woman, a vaginal examination should be made. The cervix may be found partially dilated, there may be some blood-clot present in the cervical canal and the membranes and the presenting part are usually felt. Placental tissue is not within reach of the examining finger.

Fulminant Cases. The clinical picture in such cases is very striking. The onset is sudden and associated with severe pain. In a short time the patient may present all the signs of shock and hæmorrhagic collapse. The pulse is small and quick; there is pallor, cold clammy sweats, subnormal temperature, the face shows anxiety; dyspnoea and restlessness together with thirst and air hunger and vomiting may occasionally be present; the patient may complain of dizziness, faintness, precordial pain and dimness of vision. She may sometimes enter into a condition of semi-consciousness or delirium, followed by convulsions, gradually passing on to coma and death.

In the fulminant type of cases, the patient will be in the condition of shock and hæmorrhagic collapse described above. On abdominal palpation the uterus will be found much bigger than normal, of a hard wooden consistency, painful and tender. No foetal parts can be felt on palpation and the foetal heart is not heard.

Diagnosis. Sudden onset of pain with increase in the size of the uterus, tenderness, a certain amount of external hæmorrhage, together with signs of hæmorrhagic collapse or shock, absence of foetal heart and increasing signs of anæmia indicate a severe type of accidental hæmorrhage.

The condition has to be differentially diagnosed from the following :—

- (A) Placenta prævia.
- (B) Acute hydramnios.
- (C) Tonic contraction of the uterus.
- (D) Rupture of the uterus.
- (E) Other abdominal conditions.

The following are the points of differential diagnosis :—

(A)

Abruptio Placentæ.

Placenta Prævia.

- | | |
|---|---|
| 1. Hæmorrhage comes on all at once. | Hæmorrhage repeated from time to time. |
| 2. Sense of tearing pain with shock. | Hardly any pain and no shock. |
| 3. Signs and symptoms of toxæmia may be present. | Rarely present in placenta prævia. |
| 4. Collapse disproportionate to amount of external bleeding. | Collapse always proportionate to the amount of external bleeding. |
| 5. Uterus may be tense and of a ligneous consistency. | Uterus soft. |
| 6. Uterus extremely tender and painful in fulminant type. | No tenderness; no pain complained of unless labour has commenced. |
| 7. Fœtal parts not easily palpable. | Fœtal parts easily palpable. |
| 8. Fœtal heart inaudible generally. | Fœtal heart may be audible in the early stages at any rate. |
| 9. Vaginal examination: no placental tissue felt within reach of fingers. | Placental tissue always felt in the zone of dilatation |

(B)

Abruptio Placentæ.

Acute Hydramnios.

- | | |
|--|---|
| 1. Onset sudden. | Onset sudden. |
| 2. Pain and tenderness over the uterine region present. | Pain and tenderness over the uterine region present. |
| 3. Signs of Hæmorrhagic collapse always present, pulse being rapid and thready. | No signs of hæmorrhagic collapse; signs of shock may be present, pulse being rapid, but not hæmorrhagic in character. |
| 4. Signs of pallor due to anæmia present. | No signs of pallor noted. |
| 5. Uterus of a ligneous consistency. | Uterus tense, but not of a ligneous consistency. |
| 6. Fœtal parts not palpable. Fœtal heart not heard. | Fœtal parts not palpable. Fœtal heart not heard. |
| 7. Vaginal examination: bag of waters not so tense; presenting part easily palpable. | Vaginal examination: a very tense bag of membranes; presenting part not palpable and distinct thrill may sometimes be elicited as also internal ballotment. |

(C)

Abruptio Placentæ.

1. Onset sudden.
2. Pain and tenderness severe.
3. Occurs in the later weeks of pregnancy or in the first stage of labour.
4. The uterus is hard and of a wooden consistency.
5. Signs of shock and collapse present.
6. F. H. is inaudible in the severe cases.

Tonic Contraction of the Uterus.

- Onset gradual, result of prolonged labour.
- Pain is severe but tenderness may not be marked.
- Is a result of obstructed labour in the second stage.
- Uterus is tonically contracted and the retraction ring is prominently felt.
- Signs of prolonged labour and exhaustion present but no signs of collapse.
- F. H. may be rapid or occasionally inaudible.

(D)

Abruptio Placentæ.

1. Condition may occur during pregnancy and without any sign of labour.
2. Outline of the uterus distinct.
3. Contractions of the uterus may be present.
4. Uterus enlarged and tense; foetal parts not palpable.
5. Membranes may be felt intact on vaginal examination.
6. Presenting part may be felt without any caput.
7. Urine when withdrawn of normal colour or high colour.

Rupture of Uterus.

- Usually the result of prolonged labour except in cases due to external violence or where uterine scar has given way.
- Indistinct outline of the uterus.
- No uterine contractions felt.
- Foetal parts may be palpated with undue ease, the uterus being felt as a hard tumour to one side.
- Membranes always ruptured and vagina dry and hot.
- Presenting part generally felt with a large caput.
- Urine often bloodstained.

Sometimes conditions such as biliary, renal or appendicular colic or the rupture of an abdominal viscus, twisted ovarian cyst or other intra-abdominal emergency occurring during pregnancy may give rise to signs and symptoms of hæmorrhage and shock similar to those of *abruptio placentæ*. But a careful examination of the patient with a careful history will generally enable the obstetrician to make the diagnosis without much difficulty. Occasionally an exploratory laparotomy may be the safest method where the diagnosis is uncertain.

It is well at this stage to discuss the signs and symptoms which may differentiate shock from hæmorrhagic collapse.

*Shock.**Hæm*

- | | |
|---|---|
| 1. Patient is quiet, lying listless on her back. | Patient is very restless |
| 2. Respirations shallow and quick. | Respirations laboured, gasping; air hunger |
| 3. Dizziness and faintness may be complained of. | Dizziness, faintness, vision, ringing, cramps complained of |
| 4. Skin cold and clammy. | Skin cold and clammy |
| 5. Pulse is feeble and may be fast or slow and can be felt at the wrist. | Pulse feeble, always imperceptible at the wrist |
| 6. Temperature may be subnormal. | Always subnormal |
| 7. The superficial veins are not collapsed and can be easily exposed for transfusion. | Superficial veins collapsed |

Prognosis. The mild cases are readily amenable to treatment, the prognosis being good for the mother and not for the foetus.

In the moderate cases or the mixed variety the prognosis is not unfavourable for the mother if suitable treatment is given, but prognosis for the child is bad.

In the fulminant cases the foetus is invariably lost and the mother runs grave risks.

The factors which influence the prognosis are:

- (1) Presence of toxæmia.
- (2) Presence of uterine contractions.
- (3) The amount of hæmorrhagic loss before the case is brought under observation.
- (4) The presence of any complications such as eclampsia or pelvic infection.
- (5) The nature of treatment adopted and the facilities available.

Treatment. The factors to be taken into consideration in deciding the mode of treatment are:—

- (1) The general condition of the patient.
- (2) Whether the patient is a primipara or multipara.
- (3) Whether the woman is in labour or not.
- (4) Whether case is mild, moderate or fulminant.
- (5) Whether the hæmorrhage is external, internal, or partially external and internal.
- (6) The condition of the uterus, whether contracted or feebly contracting well.

- (7) The condition of the foetus.
- (8) The condition of the cervical os.
- (9) The facilities available for treatment; that is, whether the treatment is in an institution or nursing home with adequate facilities, or in a private house.

The objects in view, whatever method of treatment may be adopted, should be:—

- (1) To arrest the hæmorrhage.
- (2) To promote delivery.
- (3) To treat the condition of shock and collapse.
- (4) To prevent postpartum hæmorrhage, and
- (5) To save the child, if possible, without increasing the risk to the mother.

The lines of treatment that may be adopted in these cases are:—

- (1) Puncture of the membranes.
- (2) Injections of small doses of pituitary extract, $\frac{1}{4}$ c.c. at a time.
- (3) Vaginal tamponage.
- (4) Dilatation of the cervix and immediate delivery either by forceps or after podalic version.
- (5) Cæsarean section—abdominal or vaginal.
- (6) Cæsarean hysterectomy.

The prognosis, so far as the foetus is concerned, is in many cases unfavourable, due to prematurity and loss of blood, so that the treatment is more often directed to saving the mother.

We shall now consider the treatment to be adopted for each of the clinical varieties.

(1) MILD CASES

(A) When the patient comes with hæmorrhage in the later weeks of pregnancy but not in labour, she should be watched carefully. Complete Rest with an injection of morphia, and treatment for toxæmia if present, should be given.

(B) *When the Patient comes in with evidence of External Hæmorrhage and the Uterus is contracting, the woman being in Labour.*

(i) If the patient, comes in with external hæmorrhage and the cervix is not dilated or easily dilatable, vaginal tamponage with a tight abdominal binder and, if necessary, a small dose of pituitary extract will arrest the hæmorrhage and promote uterine contractions. The object of vaginal plugging is threefold:—

(a) The vaginal plug prevents the escape of the blood externally, thus causing it to be retained in the uterine cavity and so increase the intra-uterine pressure. Between the plug in the vagina and the tight abdominal binder above, the placenta is compressed when the uterus is contracting, thus arresting or materially diminishing the loss of blood.

(b) The vaginal plug acts as a stimulant and provokes uterine contractions and in consequence promotes dilatation of the cervix.

(c) If the vaginal plug is properly applied the uterine arteries, as they ascend along the lateral walls of the uterus, are compressed by the plugs in the fornices and thus the flow of blood into the placental sinuses is diminished.

Method of applying the Vaginal Plug. The efficacy of this mode of treatment depends entirely upon the plug being applied properly. The woman must be prepared as for any major obstetric operation; the external genitalia cleansed and the pubic hair shaved. A vaginal douche may be given with an antiseptic solution to wash out any blood-clots, and the vagina swabbed with an antiseptic such as Dettol cream. After these preparations the vulva is draped with sterile towels; the operator, with the usual antiseptic care, draws off the urine by catheter and ruptures the membranes, if necessary. Sterile plugs of cotton-wool made in the form of small artificial sponges or sterilised gauze, soaked in antiseptic solution and rinsed dry, may be used for the plugging. A posterior duck-bill speculum is inserted and the vaginal fornices are first plugged tight, then gradually the whole of the vagina is tightly filled with small pledgets of cotton-wool. A firm abdominal binder is applied over the uterus and fastened from above downwards. A sterile vaginal pad is placed over the external genitalia and a bandage applied, which is pinned on to the abdominal binder. The vaginal plug is left *in situ* for some hours, depending upon the degree of uterine contractions. If the plugs are being expelled consequent upon dilatation of the cervix and descent of the presenting part they are removed, a hot vaginal douche given and labour allowed to proceed. If labour does not set in, the pack should not be left in for more than twelve hours. It is rarely necessary to repack the vagina.

Occasionally, when the uterus does not respond effectively and labour pains are weak, contractions may be stimulated by fractional doses of pituitary extract given at intervals of from three to four hours.

(ii) If in such cases associated with hæmorrhage the cervix is over two-fifths dilated and the head is presenting, rupture the membranes, put on a tight abdominal binder and give $\frac{1}{2}$ to $\frac{1}{4}$ cc.

of pituitary extract. In the majority of cases the increased force of the uterine contractions will cause the uterine wall to compress the placenta against the foetus and so arrest hæmorrhage. The further course of labour will be spontaneous.

(C) *If the patient is seen when the cervix is over three-fifths dilated*, or is easily dilatable and the head is presenting and engaged, so that the greatest diameter has passed through, delivery may be effected by rupturing the membranes and giving an injection of 3 units of Pituitary extract if necessary. If there is delay, application of forceps may be required to terminate the second stage.

If, on the other hand, the head is freely movable above the brim of the pelvis, and uterine contractions are not strong, it seems advisable to dilate the cervix manually and perform internal podalic version and deliver the foetus. This method of treatment is more useful in multiparæ where no disproportion between the presenting part and the pelvis is present. Occasionally it is possible to save the life of the foetus by such a method of delivery.

We do not advocate in any type of accidental hæmorrhage, any method of forcible delivery such as dilatation of the cervix by branched metallic dilators or by multiple incisions, etc. The resulting shock, hæmorrhage, laceration and possibility of sepsis are serious factors which will vitiate a favourable prognosis, and it is not in the interests of the mother to adopt any of these methods of treatment.

We are not in favour of the use of a metreurynter in these cases; De Lee however advocated it and found it useful. If a metreurynter is to be used the precaution should be taken to see that it is introduced after rupture of the membranes when the conditions necessary for its introduction are satisfied (*vide* chapter on Placenta Prævia).

In some cases it may be advisable to perform a bipolar version, bring down a foot and leave the half breech to dilate the cervix gradually. This method can be more readily adopted if the foetus is already dead.

(2) MODERATE CASES

These may be cases of external accidental hæmorrhage with a moderate amount of bleeding. They may be of the mixed variety where a portion of the blood finds its way out, while the uterus itself is distended with blood-clots—the result of the formation of a retroplacental hæmatoma. The methods of treatment already mentioned above may be adopted in the moderate cases of accidental hæmorrhage.

In the mixed variety the chief point for consideration is the condition of the uterine musculature; how far the uterus has maintained its tone and to what extent it can be stimulated to contraction. Before this can be ascertained it is necessary to relieve the tension in the uterine cavity by rupture of the membranes which may help in the expulsion of some retained blood-clots. After rupture of the membranes a small dose of pituitary extract may be given to stimulate uterine contractions, and when the uterus has begun to respond, the cases may be treated on the same lines as mild varieties of accidental hæmorrhage already discussed.

Vaginal plugging should never be attempted in the mixed variety till the uterus has begun to respond with contractions, as otherwise the blood being retained inside will stretch the uterus, diminish its tonus even more and cause further shock and internal bleeding.

If the uterus does not respond, the case then falls under the third category, namely:—

(3) SEVERE OR FULMINANT TYPE OF ACCIDENTAL HÆMORRHAGE

In these cases the uterine musculature is diseased and hæmorrhagic infiltration between the muscular fibres is present, a condition known as *uterine apoplexy*; the tone and power of contraction of the uterus is entirely lost. In such cases the condition of the patient will be one of profound shock and collapse due to the internal bleeding, and none of the measures suggested above will probably be effective in saving her life.

Before, however, attempting the methods of treatment to be outlined below, it is necessary to revive the patient from the condition of shock and collapse, and for this purpose she should be given a blood or Plasma transfusion or injections of intravenous gum saline or glucose as an alternative. The details of the treatment for shock and collapse due to hæmorrhage in the pregnant and parturient woman will be dealt with in a later chapter.

There are two possible methods of treatment in these fulminant cases—abdominal or vaginal Cæsarean section with hysterectomy if necessary. In the large majority of cases, for considerations to be explained later, the abdominal route is to be preferred.

INDICATIONS FOR CÆSAREAN SECTION IN ACCIDENTAL HÆMORRHAGE

This operation may be performed—

- (1) In cases of the fulminant type of concealed accidental hæmorrhage where the uterus is distended with blood-clots and has lost all tonicity and power of contraction.

(2) In some cases of external accidental hæmorrhage, where the bleeding is fairly free and the child is nearly full term and alive, and the cervix is not dilated.

(3) In cases of external accidental hæmorrhage, irrespective of the condition of the fœtus, when the bleeding is severe and the cervix is hard, rigid and undilatable.

(4) In conditions complicating external, accidental hæmorrhage, such as contraction of the pelvis, tumours of the uterus, ovarian cysts, cancer of the cervix complicating pregnancy and other conditions which may necessitate a Cæsarean section apart from the condition of accidental hæmorrhage.

(5) In cases where it is likely that the hysterectomy will be inevitable because of the complete loss of uterine tonus and the possibility of severe postpartum hæmorrhage. The abdominal route is preferable here.

In cases where the operator is not experienced in the vaginal technique of Cæsarean section, or where all facilities are not available, it is wise to perform an abdominal Cæsarean.

In performing the abdominal section the patient may be simultaneously rallied and the abdomen opened under local anæsthetic. After evacuation of the uterus the question to be decided is whether the uterus can be left *in situ* or should be removed. This will depend upon the condition of the uterine musculature and the tendency for postpartum hæmorrhage.

Cæsarean hysterectomy is indicated in—

(1) Cases of concealed accidental hæmorrhage where the uterine musculature is the site of apoplexy and there is complete loss of its tonus and power of contraction.

(2) Where the patient has already been examined internally, or other manipulations done and there is reasonable suspicion of sepsis, particularly if the woman is a multipara.

(3) Where other complications such as uterine fibroids, etc., exist.

Vaginal Cæsarean Section. The chief advantage of the vaginal route is that there is less risk of infection of the peritoneal cavity. Owing to the special technique of the operation and the care needed, it is not one that should be commended to the junior practitioner or to those who have not had ample experience of vaginal hysterotomy or vaginal hysterectomy. While vaginal hysterectomy may not be difficult after the delivery of the fœtus, it requires more time and elaborate care than a supravaginal hysterectomy through the abdominal route, and for this reason when the patient is in a condition of shock and collapse we do not advocate this procedure to be followed in general.

Complications. The chief complications in cases of accidental hæmorrhage are :—

- (1) Postpartum hæmorrhage.
- (2) Lacerations of the cervix consequent upon the method of delivery adopted.
- (3) Delayed shock and collapse.
- (4) Sepsis.

It is wise to be prepared for postpartum hæmorrhage and to keep everything in readiness for its treatment.

Lacerations of the cervix may be avoided by care and by the choice of a suitable method of delivery.

Delayed shock and collapse must be watched for, and it is a good rule in every case of accidental hæmorrhage to treat the patient for the hæmorrhagic loss either by blood transfusion or injection of gumarabic saline.

Septic complications are more difficult to prevent as the patient may have been handled outside, before being brought to an institution, and in other cases in spite of elaborate precautions it may sometimes be difficult to prevent the onset of mild sepsis because of the associated conditions of toxæmia and anæmia.

Lastly, every case of accidental hæmorrhage should be carefully watched during the puerperium and the patient warned not to attempt to get out of bed too early, as sudden cardiac failure or pulmonary embolism may occur in such cases.

CHAPTER XXV

PLACENTA PRÆVIA

PLACENTA PRÆVIA, as the term implies, is the condition where the placenta lies in the path which the foetus must take during its delivery *per vice naturales*. The placenta is situated wholly or partly in the zone of dilatation or lower uterine segment. The term "Unavoidable hæmorrhage" is also applied to this condition as dilatation of the lower uterine segment and the cervix with consequent hæmorrhage from placental separation must occur before vaginal delivery can take place.

Ætiology. Little is known about the ætiology of this condition. The tendency to placenta prævia increases with each pregnancy and especially when the pregnancies occur in rapid succession. It has been suggested that in some cases the low insertion of the placenta may be the result of implantation of the fertilised ovum near the cervix. Placenta prævia may occur in cases of twin pregnancy and in the condition of *placenta membranacea* due to the large size of the placenta.

Another theory is that this condition results from the development of the placenta in relation to the decidua reflexa which, as pregnancy advances, comes to cover the internal os. Placenta prævia is not infrequent in hospital practice. Thus, at the Government Hospital for Women and Children, Madras, 132 cases of placenta prævia occurred among 20,420 labours, giving a proportion of 1 in 155.

Other conditions that may predispose to the development of placenta prævia are endometritis, subinvolution of the uterus and low implantation of the tubes.

Varieties. The extent to which the placenta is inserted into the lower uterine segment varies greatly, so that it is usual to classify this condition under three headings:—

(a) Central. (b) Marginal. (c) Lateral

according as the placenta covers the entire internal os, or reaches

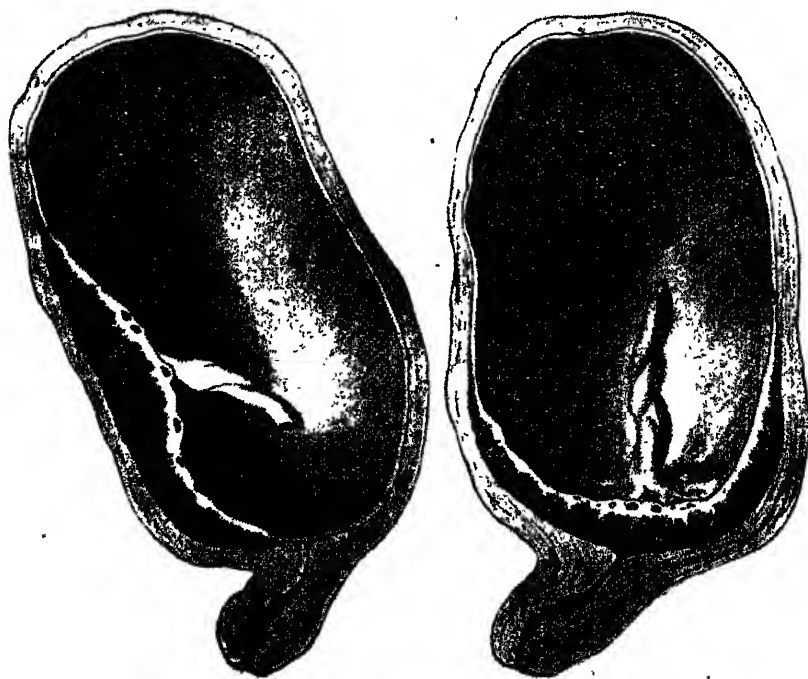


FIG. 86.—Placenta prævia.

A. marginal. B. central.

up to its margin, or merely dips into the lower uterine segment and is just within reach of the examining finger. It must be realised that these degrees depend on the dilatation of the os, so

that a case apparently of central placenta prævia at the onset of labour will become one of the marginal variety when the cervix is two-fifths dilated. A more rational classification of the varieties of placenta prævia would be to divide them into complete and incomplete varieties—the complete variety being characterised by the placenta being almost wholly in the lower uterine segment and covering the undilated internal os by its central and thickest part. The incomplete varieties are those already referred to as the marginal and lateral varieties.

Clinical Features. The most characteristic feature of this condition is the occurrence of hæmorrhage without any warning and unassociated with pain. A painless, apparently causeless, hæmorrhage occurring in the third trimester of pregnancy, perhaps when the patient is actually sleeping, is very characteristic of placenta

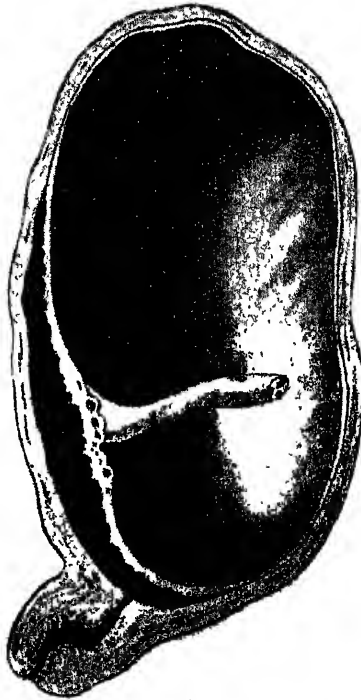


FIG. 87.—Partial placenta prævia.

prævia. Occasionally, however, the hæmorrhage occurs after some effort, such as straining at stool or lifting weights, or from jolting such as results from an automobile journey over rough roads. There is a tendency for the hæmorrhage to recur.

The commonest period when hæmorrhage occurs is during the last ten or twelve weeks of pregnancy. Sometimes it may occur much earlier, and there is no doubt that some cases of abortion and miscarriage are really due to placenta prævia.

The initial hæmorrhage may be slight and may cease suddenly only to appear at irregular intervals; on the other hand, it may be so severe that the patient is soon *in extremis*. In some cases, although the hæmorrhage stops, a slight serosanguineous discharge may continue, promoting a degree of anæmia which may severely undermine the general health of the patient.

The hæmorrhage is due to the detachment of the placenta and comes from the open placental sinuses. Occasionally it may also be from a rupture of the circular sinus of the placenta. In some cases the separation may be initiated by the same cause which gives rise to accidental hæmorrhage, that is, diseased conditions of the uterus probably associated with toxæmia. The extent of the hæmorrhage depends upon the variety of the placenta prævia, the period of pregnancy at which it occurs, the hæmorrhage being severe in the later weeks of pregnancy and in central placenta prævia.

Diagnosis. Placenta prævia as a rule is not difficult to diagnose. Indeed, the only other condition with which it may be mistaken is accidental hæmorrhage. It should always be suspected when any hæmorrhage occurs in the later weeks of pregnancy.

On abdominal palpation the presenting part may not be fixed and there is frequently a malpresentation. In rare cases it may be possible to feel a doughy swelling just above the symphysis pubis. Where hæmorrhage has occurred in a case of a placenta prævia, the os is usually sufficiently dilated to allow the finger to be passed through so that the placenta can be easily palpated and recognised. The placenta is firm and rough and pits on pressure unlike a blood-clot which is smooth and friable. If one feels placental tissue with the examining finger inserted through the cervical canal a diagnosis of placenta prævia can be definitely made; otherwise it is reckoned as a case of accidental hæmorrhage. The diagnosis is very suggestive when a patient is admitted with a history of painless causeless hæmorrhage in the last trimester or when in labour. It can be confirmed by a vaginal examination whereby one could feel the placental tissue and recognise the variety of placenta prævia. In cases of the complete variety, the thick mass of placental tissue covering the internal os may be felt whereas in the incomplete varieties, it may be felt close to the margin of the cervix or higher up by sweeping the finger round inside the cervical canal. Occasionally cancer of the cervix complicating pregnancy

may be mistaken for placenta prævia. In the only other condition for which placenta prævia was a hydatidiform mole, where the house surgeon is vain to perform internal podalic version.

Another sign of some importance is that if a diagnosis be made of the membranes, even when the placenta is within reach, it will be found that they are some distance from the placenta. The placenta is low down instead of being some distance above. After delivery, if the after-birth be examined, it will be found that the rent in the membranes is close to the margin.

A sign that can occasionally be made out is that the cervix is not dilated sufficiently is the doughy feel on the cervix and the soft pitting sensation that can be experienced on one or other of the fornices. A word of caution is necessary in regard to vaginal examination in placenta prævia. However careful and delicate the examination may be, it may sometimes provoke hæmorrhage which may be very profuse. For this reason it is recommended that in every case of placenta prævia, examination should be conducted only in an operation theatre where facilities are available for treatment of any form including hæmorrhage. In some cases, where at the time of delivery the institution, the cervix is closed and the bleeding stopped for the time being, radiological methods such as amniography, cystography or soft tissue radiography may be usefully employed. Details of these methods are given in another chapter.

Differential Diagnosis. The chief condition which placenta prævia may be confused with is *abruptio placentæ*. The most certain method of differential diagnosis is by digital examination. If placental tissue is not felt by the finger in the cervical canal the case may, for all practical purposes, be one of *abruptio placentæ*. Other conditions which may be confused with placenta prævia are hæmorrhage during this period of pregnancy, erosion of the cervix, mucous polyp, growths about the cervix and vagina and traumatic lacerations of the cervix or lower segment of the uterus. A careful history of the case, together with the vaginal examination, will usually settle the diagnosis.

Occasionally placental tissue may be mistaken for the presenting part in foetal monstrosities, such as exomphalos, meningocele and spina bifida. The differential diagnosis between placental tissue and blood-clot is given above. Other conditions can be differentiated by the same methods.

examination, if necessary, with the patient under anæsthesia. Occasionally a visualisation with the help of a speculum may be of advantage.

Complications. Several complications may arise as a result of placenta prævia. Among the commoner are malpresentations, premature labour, prolapse of the cord, weak uterine contractions, etc.

During Pregnancy. Greater tendency for abortion or miscarriage; malpresentations and malpositions; onset of premature labour.

During Labour.

First stage: Weak uterine contractions; delayed engagement or non-engagement of the presenting part.

Second stage: Prolapse of the cord; abnormalities in rotation in cephalic presentations; prolonged labour and greater necessity for artificial assistance; lacerations of the cervix.

Third stage: Postpartum hæmorrhage either from lacerations or atonicity of the uterus; adherent placenta.

Later, *during the puerperium*, the patient may run the risks of puerperal sepsis, subinvolution, phlebitis and chronic endometritis.

Prognosis. The prognosis is unfavourable for the mother and child. The mortality varies under different circumstances. If the case is seen early and effective assistance rendered the mortality, especially the maternal, will be markedly decreased.

The foetal mortality is always great in this condition, partly due to prematurity and partly due to the great loss of blood. The foetal mortality depends upon—

- (1) The period of pregnancy at which the hæmorrhage occurs.
- (2) The variety of placenta prævia.
- (3) The amount of hæmorrhage before assistance is obtained.
- (4) The method of treatment adopted.
- (5) Whether the patient is a primipara or a multipara.
- (6) The condition of the cervix, that is, whether the cervix is soft and easily dilatable, and the extent of dilatation.

So far as the mother is concerned the prognosis depends on the variety of placenta prævia, the complete being far more dangerous than the incomplete; the condition of the patient on admission; the period of pregnancy and the presence or otherwise of any complications such as toxæmias, contraction of the pelvis,

anæmia and other general diseases. A repetition of placenta prævia in subsequent pregnancies is very rare.

Treatment. The objects we have in view in the treatment of this condition are :—

- (1) To arrest the hæmorrhage.
- (2) In the majority of cases to promote labour and complete delivery.
- (3) To prevent postpartum hæmorrhage.
- (4) To treat the shock, collapse and the anæmia resulting from the hæmorrhage.

Certain general considerations may now be stated. Placenta prævia may give rise to hæmorrhage at any period of pregnancy during the last trimester. The termination of pregnancy, considerably in advance of full term, will adversely affect the chances of survival of the fœtus. In certain cases of mild hæmorrhage may we therefore temporise and so prolong the period of intra-uterine life of the fœtus? The hæmorrhage in a case of placenta prævia recurs at irregular intervals, and it is impossible to anticipate the extent of the subsequent hæmorrhage when it occurs. Accordingly temporising is undoubtedly attended with grave risks to the mother, but in exceptional cases one may take the risk. This, however, should only be done in institutions where constant observation day and night is possible and where adequate assistance can be given without any delay. In all other cases the interests of the mother are so paramount and the chances of the survival of the fœtus, particularly in the earlier periods of the last trimester so negligible, that it is justifiable to terminate pregnancy. This usually results from the methods of treatment adopted to check the hæmorrhage.

The *expectant method* of treatment may be adopted in those cases where the patient has had but one single hæmorrhage, not of a severe nature, and the child is viable. In such cases the patient must be hospitalized and complete rest in bed ensured; a small dose of morphia, $\frac{1}{4}$ grain, or other opiate may be given. The patient should be on light and nutritious diet; the bowels should be emptied with glycerine enemata if necessary, and uterine sedatives such as bromides may be administered, together with calcium lactate and injections of vit. K. to increase the coagulability of the blood. This method of treatment may possibly help in preventing a further immediate hæmorrhage. Should, however, a fresh attack of hæmorrhage occur, conservative measures must be abandoned and one of the active methods of treatment to be out-

lined later adopted. But the advantage of the expectant regime is that even a few days gained increases the possibilities of survival of the foetus after delivery.

Where active methods of treatment are necessary for placenta prævia, it may be by any one of the following :—

- (1) Rupture of the membranes.
- (2) Rupture of the membranes and injections of pituitary extract.
- (3) Vaginal tamponage.
- (4) Braxton-Hicks' method of bipolar version.
- (5) The use of the metreurynter.
- (6) Willett's forceps.
- (7) Immediate delivery by internal podalic version and extraction, or in some rare cases with forceps.
- (8) Cæsarean section—abdominal or vaginal.

We may state here that considerable judgment is needed in selecting the particular method of treatment for a particular case. It may be stated that *accouchement forcé*, that is, forced or rapid delivery associated with rapid artificial dilatation of the cervix, has no place in the treatment of placenta prævia. The cervix in this condition has been aptly compared to a piece of wet blotting paper, and tears so easily if subjected to any forcible dilatation that such methods must unhesitatingly be condemned.

1. Simple Rupture of Membranes. In a certain number of cases, particularly the marginal or lateral varieties of placenta prævia, and in multipara with a soft dilated cervix where the uterine contractions are already in progress, simple rupture of the membranes, with application of a tight abdominal binder, allows the presenting part to fix in the pelvis and thereby compress the placental site, arrest the hæmorrhage and facilitate the progress of labour.

2. Rupture of the Membranes and Injections of Pituitary Extract. This method is exceedingly useful in those cases where, with a soft dilatable cervix in the condition of placenta prævia marginalis or lateralis, the uterus is not contracting properly or effectively, provided there is no disproportion between the presenting part and the pelvis and no malpresentation exists. It should therefore be used where the vertex presents, generally in a multipara, occasionally in some cases of primiparæ also, the cervix

being nearly three-fifths dilated or soft and dilatable. The membranes are ruptured and the patient is given $\frac{1}{2}$ to $\frac{1}{4}$ c.c. of pituitary extract and a tight abdominal binder applied. Uterine contractions are provoked by which the presenting part is fixed and the placental site is compressed, thereby checking the hæmorrhage. Labour is often terminated spontaneously without further complication.

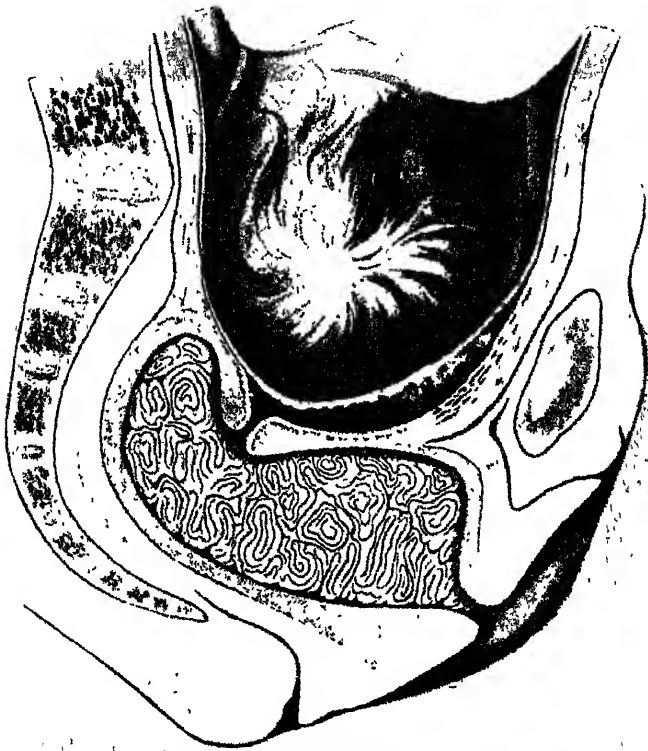


FIG. 88.—Plugging of the vagina in placenta prævia.

3. Vaginal Tamponage. The method of vaginal plugging has obvious disadvantages and should only be adopted as an emergency measure in those cases where other methods of treatment are not immediately possible. The disadvantages of vaginal plugging are :—

- (1) That it produces a certain amount of shock.
- (2) That it increases the risks of sepsis, which is especially great in the condition of placenta prævia owing to the low attachment of the placenta,

On the other hand, there is perhaps no method of treatment so readily available and so immediately effective as vaginal tamponage, if properly done. As an emergency measure in outdoor practice, to tide over the possibility of severe hæmorrhage till the patient is taken to an institution for treatment, we believe that vaginal tamponage has a definite place in the treatment of placenta prævia.

In certain cases also, where the cervix is less than two-fifths dilated and where from certain considerations, only the vaginal route delivery is decided upon, it may be necessary to resort to vaginal tamponage as an intermediary measure before other methods can be adopted.

If vaginal tamponage is decided upon, the same precautions should be taken as have already been described in the chapter on *abruptio placentæ*, and the tamponage should be carried out in a similar manner.

It is advantageous in these cases to rupture the membranes before the tamponage is done and also to give small doses of pituitary extract— $\frac{1}{2}$ c.c. if the uterus is not contracting.

4. Braxton-Hicks' Method of Bipolar Version. If this method is to be successful the os should be sufficiently dilated to admit two fingers. Bipolar podalic version is done if the presentation is not already a breech. The membranes are then ruptured and a foot grasped by the fingers and brought down through the cervical canal. The half-breech compresses the placenta against its site and arrests the hæmorrhage. Occasionally it may be useful to tie a loop of sterile gauze round the ankle of the foetus and attach to its end a small weight of about 1-2 lbs. and suspend it over a pulley fixed on to the foot of the bed. By such traction on the leg the half-breech constantly compresses the placenta against its site and so controls hæmorrhage. The half-breech not only arrests the hæmorrhage but stimulates the uterus to contract, and in course of time spontaneous delivery is facilitated.

This method of treatment may be adopted if the woman has lost much blood, the foetus is dead or premature. After controlling the hæmorrhage by bringing down a leg, do not extract the child, till the cervix is dilated fully as tears will occur otherwise followed by shock, hæmorrhage and later on sepsis. For the same reason do not give pituitary extract and do not apply traction on the leg unless bleeding recurs. If bleeding recurs, slight traction on the leg may be sufficient, and once the hæmorrhage has been arrested measures can be adopted to replace the blood loss.

The obvious disadvantage of this method of treatment is that it still further reduces the chances of the child surviving. Where,

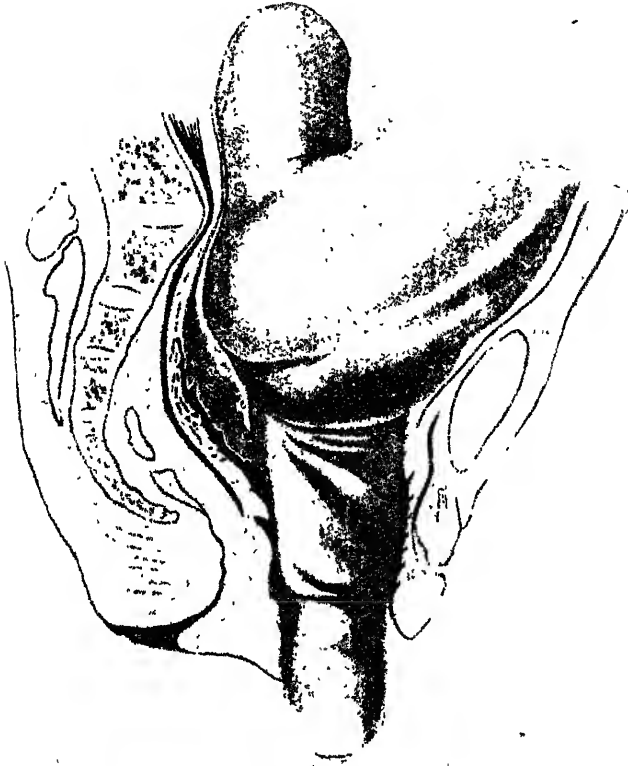


Fig. 89.—Braxton Hicks' method of treatment in placenta prævia.

Note the half breech compressing the placenta.

therefore, the foetus is alive and might reasonably be saved, other methods of treatment should be adopted.

5. **The Use of the Metreurynter.** Hydrostatic dilators of various types have been used in the treatment of placenta prævia, and the most common and useful of these is Champetier de Ribes' bag. The objects of introducing these hydrostatic dilators are :—

- (1) To arrest the hæmorrhage by pressure on the placental site.
- (2) To provoke uterine contractions.
- (3) To dilate the cervix uniformly.
- (4) To take the place of the bag of membranes and thus prevent further escape of liquor amnii.

- (5) To stretch the vaginal canal, so that further delivery may be easy.

Champetier de Ribes' bag is made of oiled silk and ordinarily measures about 9 cm. ($3\frac{1}{2}$ ins.) at its widest diameter when

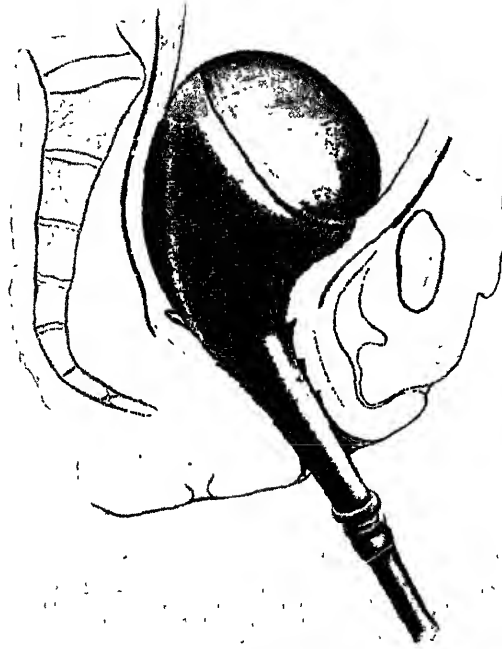


FIG. 90.—Champetier de Ribes' bag *in situ*.

distended with fluid. The bag is used in other conditions besides placenta prævia, such as—

- (1) Premature rupture of the membranes.
- (2) Imperfectly dilated cervix.
- (3) In cases of prolapse of the cord with a partially dilated cervix where it is used after reposition of the cord.
- (4) As a method of dilating the vagina.

The precautions to be taken in the use of the bag are :—

- (1) The bag should be tested to see it is not leaking.
- (2) The capacity of the bag should be definitely ascertained before introduction.
- (3) The bag should be sterilised before use.
- (4) The cervical os should be dilated at least two-fifths.
- (5) The membranes should be ruptured before the bag is introduced.

There is a special instrument used for the introduction of this bag called the Champetier de Ribes' bag introducer. When the bag is to be used the patient is placed in the lithotomy position, the external genitalia are cleansed, the usual antiseptic precautions are taken, a posterior vaginal speculum is inserted, the cervix is steadied with a sponge-forceps and after folding the bag and holding it by means of the introducer, the membranes having been ruptured previously, the bag is inserted through the cervical canal past the internal os, so that at least two-thirds of the bag lies beyond the internal os. The bag is next filled with a fluid—any mild antiseptic or sterile fluid may be used for this purpose. A Higginson's syringe is attached to the rubber tubing connected to the bag and the fluid is pumped in. After the bag is partially filled the introducer may be unlocked and gradually removed, the two blades being taken out separately as in the removal of an obstetric forceps. When the bag has been completely filled the stop-cock is closed, a weight not exceeding 2 lbs. is tied to the end of the tube and suspended over a pulley fixed to the foot of the bed. If uterine contractions are present it may not be necessary to attach the weight, but in the absence of such contractions it is desirable to use a weight. It is necessary to relieve the traction of the weight at intervals of fifteen minutes, so that the constant pressure and the pull exerted may not unduly compress the birth canal and so lead to ischaemic necrosis. The bag should not be left in longer than eight hours, and if labour pains have not progressed it is better to empty the bag, remove it, reintroduce it if necessary or decide on some other method of treatment. But where uterine contractions supervene and labour proceeds satisfactorily the bag is gradually expelled into the vagina. It is wise to be on the look out for this, as once the bag is expelled into the vagina the placenta is no longer compressed and haemorrhage may once more occur, the blood collecting above the bag resulting in a severe form of collapse. Once the bag is expelled through the cervical canal it should be removed and labour terminated by breech extraction, podalic version and extraction, or forceps delivery.

6. Willett's Forceps. Willett, in 1925, showed that by means of a special forceps which he had devised, traction could be applied to the foetal head so as to exert pressure on the placental site and thus arrest haemorrhage. Thus pressure is exerted continuously and dilatation of the cervix is facilitated so that labour progresses resulting in spontaneous delivery.

The cases most suitable for this form of treatment are vertex presentations, with a marginal or lateral placenta praevia where

the cervical dilatation is sufficient to admit two fingers. The forceps is passed through the dilated os after rupture of the membranes and pressed against the head, which is kept in position by an assistant steadying it from above. The forceps then grasps a portion of the scalp. A weight of 1 or 2 lbs. is attached to the handle of the instrument by a tape, which is then slung over a pulley at the edge of the bed.

This method of treatment is fairly simple and effective in suitable cases. We do not think it is of much service in cases of central placenta prævia; nor would we advocate this method of treatment where, because of the severity of hæmorrhage, more

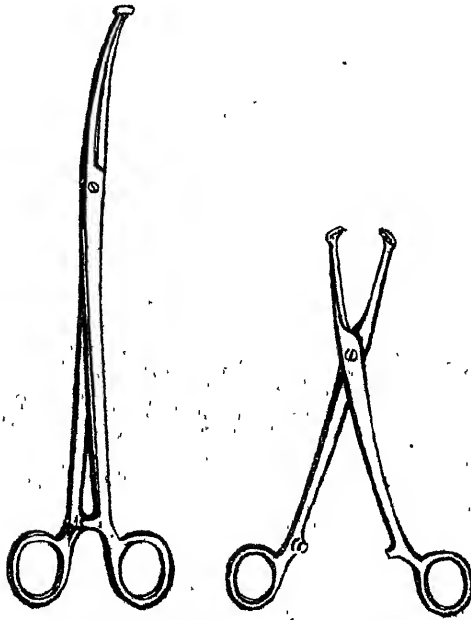


FIG. 91.—Willett's forceps: Two sizes.

urgent measures of treatment are needed. Obviously Willett's forceps is not of use unless the presentation is a vertex and there is no disproportion between the pelvis and the cephalic pole.

In some cases where the foetus is dead and the presentation is a vertex, the application of Willett's forceps with traction is not sufficient to effectively compress the placental site and favour descent. This may be due to causes such as deflexion attitudes of the foetus or to some degree of pelvic contraction. In such cases continuous slight oozing will occur. Under such circumstances it will be found useful to perforate the cephalic pole, apply a cranio-

clast and exert traction on it by a weight not exceeding 2 lbs attached by a piece of tape and suspended over a pulley as in the case of Willett's forceps. The hæmorrhage is arrested by the descent of the head and delivery occurs spontaneously.

7. **Immediate Delivery.** We advocate this method of treatment only in those cases where all conditions necessary for a safe immediate delivery are present. Where the os is fully dilated, instead of allowing slow hæmorrhage to continue, we think it is preferable to terminate labour immediately by internal podalic version and extraction if the head is not engaged in the brim of the pelvis, or by extraction in cases of breech presentation, or by



FIG. 91a.—Willett's forceps *in situ* in a case of placenta prævia. Note the position of the pulley and weight.

the application of forceps in those cases where the head is already engaged.

A word of caution should, however, be mentioned in this connection, because the application of forceps, unless done when the cervix is fully retracted above the presenting part and every care is employed, is likely to lead to considerable trauma and cause further hæmorrhage, besides predisposing to infection.

In some cases, after performing internal podalic version and bringing down a foot, it may be advisable to leave the completion of labour to natural powers.

8. **Cæsarean Section.** Cæsarean section has now come to occupy an important place in the treatment of placenta prævia. It may be done either by the abdominal or the vaginal route.

So far as the abdominal route is concerned, the conditions under which this operation may be necessary or deemed advisable are :—

- (1) In an elderly primipara where the cervix is rigid and not easily dilatable.
- (2) In many cases of central placenta prævia where the foetus is alive, particularly at or near term.
- (3) In multiparæ where the cervix, due to previous injuries, is cicatrized, fibrosed and not easily dilatable, and the placenta is either central or lateral; it is much better in these cases to deliver the child by an abdominal Cæsarean section than to attempt any vaginal mode of delivery.
- (4) In all cases of placenta prævia complicated by cephalopelvic disproportion.
- (5) In cases where the saving of the foetal life is of considerable importance, it is much better not to run the risks of foetal asphyxia or foetal death by vaginal modes of delivery.
- (6) Where complications such as fibroids exist in association placenta prævia, the abdominal route is undoubtedly the best.

In cases of severe hæmorrhage where immediate arrest is impossible by the usual vaginal methods of treatment, it may occasionally be more beneficial to perform a Cæsarean section. Wherever possible the lower segment Cæsarean section is advisable.

Where the patient has already been examined or treated outside, and the chances of sepsis are therefore considerable, Cæsarean hysterectomy may have to be considered.

Occasionally, if at Cæsarean section hæmorrhage cannot be easily controlled, the necessity for hysterectomy may again have to be considered.

Vaginal Cæsarean Section. Essen Möller has advocated this method of treatment, particularly in view of the fact that there is less chance of infecting the peritoneum and less shock to the patient. It can also be adopted in those cases where other methods of treatment through the vaginal route have not been found successful. It is not a method that can be recommended to the beginner, as to be successful the operator requires to have had a considerable experience in the technique of vaginal methods of

delivery and of vaginal operations; but there are most certainly cases where this type of operation will considerably improve the prognosis. The details of the operative technique will be discussed in the chapter on operative obstetrics.

Whatever may be the line of treatment that is adopted, two things must be kept in view: (1) the necessity to treat the collapsed condition in which the patient is generally found; and (2) the prompt arrest of postpartum hæmorrhage that is so likely to occur after delivery. Before any method of treatment outlined above is adopted, the patient should first be treated for collapse. Transfusion of blood or Plasma or intravenous injections of gum saline or glucose saline are most valuable. Cases of postpartum hæmorrhage occasionally show delayed collapse, so that before starting any manipulative interference it is wise as a matter of routine to give the patient a transfusion. Other methods usually adopted for the treatment of collapse should also be followed.

Complications. Complications in a case of placenta prævia are hæmorrhagic collapse, lacerations of the cervix, shock and sepsis. Collapse and shock are in a measure inevitable, but their severity can be very much lessened by adopting suitable methods of treatment as outlined above. Lacerations of the cervix ought to be avoided by care in vaginal examinations, by conservative methods of delivery and by the utmost precaution in the use of any instruments or bags in the treatment of this condition. Sepsis is a troublesome sequel if it occurs, and too great care cannot be taken in trying to avoid it by not resorting to frequent vaginal examinations and manipulations and by scrupulous anti-septic precautions at every stage of the treatment and delivery of the patient.

De Lee has laid down the excellent axiom that no woman with placenta prævia should die except in the very rare instances of air embolism, hæmorrhagic diathesis or spontaneous rupture of the uterus. In our experience hæmorrhagic diathesis and spontaneous rupture of the uterus are exceedingly rare, and we would subscribe to this axiom if the patient has summoned medical help as soon as the first flooding occurs and her general condition then is not unsatisfactory. Cases of anæmia with placenta prævia present problems in the method of treatment which so far baffle all solution. In some cases of extremely lowered vitality, with one or other of the tropical diseases such as malaria, kala-azar, tubercular diarrhoea, pernicious anæmia of pregnancy, or the devitalised patient resulting from malnutrition and avitaminosis, placenta prævia affords a convenient apology for the terminal event of life, despite every method of treatment possible.

SECTION VI

PATHOLOGY OF LABOUR

CHAPTER XXVI

DYSTOCIA IN LABOUR

THE term *dystocia* is used to signify the condition where some difficulty is experienced in parturition. Eutocia, on the other hand, is the term which implies normal labour. There are several conditions on the part of the foetus and on the part of the mother which may give rise to dystocia.

Dystocia from foetal causes may be due to :—

- (1) Faulty position.
- (2) Faulty attitude.
- (3) Faulty presentation.
- (4) Foetal abnormalities.

Dystocia due to maternal causes may be due to anomalies in any of the following factors :—

- (1) The forces of labour.
- (2) The parturient tract and adnexa.
- (3) General maternal conditions.

We shall first take up the foetal causes underlying dystocia.

Dystocia Due to Faulty Positions

OCCIPITO-POSTERIOR POSITIONS

In a vertex presentation the occiput may be posterior and lie either on the right side of the pelvis or on the left side—the right occipito-posterior position being more common. The condition is frequently met with and statistics show that in 25 to 30 per cent. of vertex presentations the position is occipito-posterior.

Mechanism. In a favourable case the mechanism differs from that of an occipito-anterior only in the extent through which the occiput has to rotate, namely, three-eighths of a circle or 135° , instead of one-eighth of a circle or 45° . This however, is a matter of considerable importance as an occipito-posterior, in trying to rotate, may come to occupy one of four positions :—

- (1) The occiput may rotate and become an occipito-anterior, but the rotation falls short of a complete rotation into

the antero-posterior diameter of the pelvic outlet and delay is thus encountered.

- (2) Partial rotation of the occiput may occur, rotation occurring through only 45° and the sagittal suture comes to lie in the transverse diameter of the pelvis.
- (3) The occiput may fail to rotate altogether and may lie in the position in which it first entered the pelvis, that is, opposite the sacro-iliac synchondrosis. It is then known as *persistent occipito-posterior*.
- (4) *Reverse rotation* of the occiput may take place and the occiput comes to lie in the hollow of the sacrum. This is then called an *occipito sacral position*.

Unless an anterior position is produced spontaneously, some degree of dystocia results, as incomplete flexion of the head persists and so causes larger diameters to present.

Diagnosis. Inspection shows flattening below umbilicus and more marked foetal movements. An occipito-posterior position is usually easily diagnosed by abdominal palpation, if the uterine and abdominal walls are not too tense. The foetal limbs are more easily felt than usual, and lie nearer the middle line of the body and on either side of the umbilicus; position of the back cannot be made out easily, the head may not be engaged in the pelvis; auscultation reveals that the point of maximum intensity of the foetal heart



FIG. 92.—Reversed rotation of the occiput.

sounds is generally in one or other of the flanks much lower and farther out than in an anterior position. Sometimes, the anterior shoulder can be palpated farther away from the middle line.

On vaginal examination the presenting part may be found rather high; the sagittal suture is in one of the oblique diameters, with the anterior fontanelle in one or other of the anterior quadrants of the pelvis, while the posterior fontanelle is nearer the sacral hollow in the opposite posterior quadrant.

At a later stage, when there is difficulty in palpating the foetal parts owing to strong uterine contractions and help at delivery is required, an occipito-posterior position may be suspected by the vaginal findings and under the following conditions:—

- (1) Greater difficulty in the introduction of the blades of the forceps.
- (2) Difficulty in locking the blades as the handles of the forceps do not approximate as usual.
- (3) Tendency for rotation of the forceps to occur on traction.
- (4) Tendency for the forceps to slip, causing stretching of the vaginal walls lower down.

Course of Labour. In occipito-posterior cases labour is usually prolonged because of a misfit between the pelvis and the presenting part. The foetus tends to assume the military attitude of slight extension in which the head presents so that the sub-occipito-frontal ($4\frac{1}{2}$ ins.) or occipito-frontal diameter ($4\frac{1}{2}$ ins.) attempts to engage in the brim instead of the suboccipito-bregmatic diameter ($3\frac{3}{4}$ ins.). Again, instead of the bitemporal diameter ($3\frac{1}{2}$ ins.) the biparietal diameter ($3\frac{3}{4}$ ins.) lies in the sacrocotyloid diameter of the pelvis which runs from the promontory of the sacrum to the ileo-pectineal eminences. This means that larger diameters than are met with in occipito-anterior positions attempt to engage, and this explains the frequency of non-engagement of the head at the beginning of labour and also the delay in descent and rotation.

Once the head does engage, descent is slow and internal rotation is therefore delayed, for it cannot occur till the head reaches the pelvic floor. Once complete rotation has been rendered possible by the head becoming properly flexed and the smaller suboccipito-bregmatic diameter substituted for the large occipito-frontal diameter, the movement is accomplished rapidly.

If the head descends as a persistent occipito-posterior, it over-distends the vagina and reflexly produces very powerful uterine contractions which may succeed in effecting a spontaneous delivery, although more usually the aid of forceps is required. Delivery face to pubes always results in deep vaginal and perineal lacera-

tions which may involve the rectum, because of the over-stretching of vagina and vulva.

Prognosis. Owing to the delay caused and the greater amount of moulding and pressure to which the head is subjected in the course of labour, the prognosis for the fœtus is more unfavourable than in an occipito-anterior position. The longer duration of labour, the necessity for vaginal examinations, the greater tendency for laceration of tissues, and the need for assistance and particularly instrumental delivery, all increase the mother's risks and make the prognosis a little more unfavourable. Consequent upon the delayed labour, postpartum hæmorrhage may occur increasing the risk for the mother.

Treatment. This depends upon the stage at which the case is seen. In view of the fact that an occipito-posterior position may sometimes result in a reverse rotation of the occiput and cause delay in labour, thus increasing the risks to the fœtus, attempts should be made in the later weeks of pregnancy to promote a more favourable position.

This can be done by the method of abdominal manipulation recommended by Buist. The back of the fœtus is brought to the front as much as possible and then two pads are applied, one just behind the back of the fœtus, the other on the opposite side, and a tight abdominal binder applied. The pad applied behind the back presses it forward, while the other applied on the opposite side pushes the limbs posteriorly, and thus favouring forward rotation of the back of the fœtus.

If the patient is seen after the onset of labour the treatment will depend upon the stage of labour and the progress of the head along the birth canal.

A. Early in Labour and before the Membranes have Ruptured. Anterior rotation of the occiput may be favoured by postural treatment. The woman may be made to lie on the side to which the occiput is pointing. In cases of right occipito-posterior the woman would lie on the right side, and in cases of left occipito-posterior on the left side. With postural treatment it is advantageous to apply an abdominal binder, and in some cases pads may be applied on either side as suggested by Buist.

When a case of occipito-posterior is met with, care must be taken to see that the position is not due to any serious disproportion between the head and the pelvis, or any factor causing obstruction to the advance of the head; and if any such factors are present the treatment will depend upon the degree and nature of the disproportion or the factor concerned in obstruction. It is also desirable in occipito-posterior positions not to allow the patient to

walk about in the first stage of labour, as frequently, owing to the head not fixing properly at the brim of the pelvis, the membranes rupture prematurely and sometimes the cord may prolapse—complications which add to the difficulties of delivery.

Where an occipito-posterior position is recognised at the onset of labour it is important to remember that, given time, the natural tendency is for the head to rotate anteriorly. Premature attempts at interference will only lead to a greater amount of difficulty in the extraction of the head and injuries to the child and the mother and must therefore be avoided.

B. *After the Membranes have Ruptured.* A method of treatment that will be found suitable in cases where the occiput is posterior and the head has not entered the brim of the pelvis is to perform internal podalic version and extract the fœtus if necessary. We commend this method, particularly in cases of multiparæ, where there is no relative disproportion between the head and the pelvis and where the condition is frequently not diagnosed till late in labour, with the cervix nearly fully dilated and the head still arrested above the brim of the pelvis. This method may also be useful in cases of flat pelvis of a moderate degree where the after-coming head favours easy delivery more than the fore-coming head.

If, however, the occipito-posterior position is met with at a later stage in labour, when the head has partially descended into the cavity, the occiput may be arrested at any stage of its rotation to the front, or in some cases reverse rotation of the occiput may take place and the occiput may actually lie in the hollow of the sacrum. The treatment will therefore necessarily depend to a certain extent upon the position of the occiput in the pelvis and also upon any disproportion that may be present between the fetal head and the pelvis. If there be no disproportion, in a majority of cases the occiput will rotate to the front, provided sufficient time is given and the uterus is encouraged to contract adequately. The patient should, under these circumstances, be kept at rest, given sedatives to alleviate suffering and yet permit of full dilatation of the cervix, so that she may not become exhausted by the prolongation of labour. Glucose, fruit juice and any refreshing drinks, along with a chloral and bromide draught, or small doses of morphine with hyoscine, may be of considerable help in promoting a certain amount of sleep, after which the patient will probably awake refreshed and the uterine contractions will be more effective. Should, however, internal rotation not take place or reverse rotation occur in spite of the treatment outlined above, it

may be necessary to interfere and help forward rotation of the occiput. This may be done by any of the following methods:—

(1) By favouring increased flexion, by pushing the sinciput up or bringing the occiput down, by means of fingers introduced into the vagina. Simultaneously with this, pressure is applied to the fundus towards the occipital pole so as to promote a greater degree of flexion.

(2) In cases where the uterine contractions are not sufficiently strong, it is advisable to give a small dose of pituitary extract ($\frac{1}{6}$ c.c.), particularly if the dilatation is nearly complete, as in such cases the increased force of uterine contraction tends to sweep the occiput to the front; even if forward rotation is not complete, once the occiput tends to move forward subsequent delivery will be rendered easy and forward rotation can be helped by any of the manœuvres to be suggested later.

It may in this connection be stated that two of the fundamental factors that prevent forward rotation of the occiput are (a) weak uterine contractions and (b) laxity of the pelvic floor due to old lacerations in multiparæ. Other factors that might hinder the rotation of the occiput forward are cord round the neck, a large-sized baby, a loaded rectum or distended bladder, or a hand nipped by the side of the head or pressed against the chin of the foetus, interfering with the movement of internal rotation.

(3) Anterior rotation of the occiput may be favoured by the introduction of the half hand into the vagina, with the patient under an anæsthetic, and grasping the head between the thumb and the fingers and gradually bringing it to the front. Simultaneously with this manipulation, it is desirable that the other hand should be applied to the anterior abdominal wall behind the anterior shoulder and the shoulder pushed in the same direction. An assistant may sometimes perform this manœuvre while the operator is trying to rotate the occiput forward *via* the vaginal canal.

In some cases where the uterus is not tonically contracted and the head wedged in the pelvis, the occiput may be gently pushed up a little to aid forward rotation by the half hand.

(4) If, however, these methods do not succeed, or if the occiput rotates backwards and the necessity for interference is urgent owing to the condition of the foetus or mother, the following mode of delivery may be attempted:—

(a) Rotation with the half hand and the application of forceps. In some of these cases, after rotation by the hand and before the forceps is applied, the occiput

may tend to slip back. In the majority of cases, however, after the occiput has been rotated to the front, it can be steadied by the palm applied posteriorly, while the blade of the forceps is slipped in and is kept in position by an assistant. It is not necessary that the occiput should completely rotate to the front. In cases where reverse rotation has taken place and the occiput is absolutely posterior, it should be dislodged from that position and brought forward, at least to the transverse diameter of the pelvis, that is through 90° complete, in which case forward rotation of the occiput will very often take place during the process of traction if gentle manipulations in that direction are used.

- (b) In some cases where the half hand has not been able to rotate the head, rotation with the forceps may succeed.

Objection has been taken to the use of forceps as a rotator, and it has been rightly emphasised that the main function of the forceps is that of a tractor. The obvious disadvantages of using the forceps as a rotator are :—

- (i) That in the movement of rotation the blades of the forceps are likely to cause injury to the maternal soft parts resulting in lacerations of the vaginal walls.
- (ii) Bruising of the anterior vaginal wall leading to damage to the bladder may occur.
- (iii) Hæmatoma may be produced in the areolar tissue of the pelvis.
- (iv) The urethra may be stretched and lacerated.
- (v) The child's head and neck may suffer damage.

These dangers are very real if rotation with the forceps be tried in a mechanical manner so that the occiput is forcibly carried to the front. The rotation that we advise is based on a different conception altogether. When the forceps is applied, with the occiput in a posterior position and light traction made, in the majority of cases there will be a tendency for the occiput to rotate as a result of the head coming down slightly and pressing upon the pelvic floor. The operator should wait and watch for this little movement and then gently aid it *by rotating the forceps as traction is applied*. Once the head has come down from the position in which it was almost impacted, there will be a natural tendency for

the occiput to rotate, and it is this factor that ought to be taken advantage of in promoting rotation gradually with the forceps. There is no need to rotate the occiput completely to the front with the forceps, and any slight degree of rotation forward will, in the majority of cases, considerably help in the delivery of the head by steady, light traction. Occasionally, when the forceps is applied and traction made, the occiput slips out suddenly face to pubes.

The dangers of the head being born with the occiput posterior are :—

- (1) Extensive damage to the maternal soft parts, particularly laceration of the perineum which may extend even into the rectum.
- (2) Damage to the foetal head which may be considerable, and even if actual fracture of the bones of the skull does not take place, tears of the meninges or intracranial hæmorrhages are not infrequent.

Where the forceps is used in the manner suggested above to help forward rotation, it may be necessary to remove the blades of the forceps and to reapply them before continuing traction, as otherwise the forceps, if applied with reference to the lateral walls of the pelvis, having rotated into the antero-posterior plane, may cause damage to the urethra and the bladder.

Where the foetal heart is not audible and the child is obviously dead, there is no advantage in submitting the mother to unnecessary trauma, and in such cases it is better to perforate the head when it is found that traction with forceps is not followed by an easy delivery.

In some cases of occipito-posterior position a further difficulty in the delivery of the foetus may be due to the formation of a contraction ring, which prevents descent of the shoulders and delivery of the head through the outlet. The treatment of this condition will be dealt with in the chapter on anomalies of the uterine forces.

We do not consider it necessary to refer to such operations as Cæsarean section or pubiotomy in the treatment of uncomplicated cases of occipito-posterior position, as in our experience such operations are neither indicated nor warranted in the treatment of this condition. In cases, however, where the condition is complicated by contractions of the pelvis, the treatment must necessarily be modified and will depend upon the nature and degree of contraction. This aspect of the complication will be dealt with elsewhere.

Dystocia Due to Faulty Attitude

The normal attitude of the foetus *in utero* is one of universal flexion. The normal degree of flexion results in a *vertex* presentation, where that part of the foetal skull which lies between the anterior and posterior fontanelles presents. In cephalic presentations, therefore, if the attitude of flexion is deviated from in any respect, difficulties may arise in the course of delivery. The normal degree of flexion may be either increased or diminished within certain limits.

The following anomalies may then arise viz :—

(1) Excessive flexion giving rise to the condition which will later be described as *Roederer's obliquity*, where the presenting part is the occipital bone.

(2) If the flexion is incomplete, only the bregma or *anterior fontanelle* may be the presenting part.

(3) If instead of flexion a minor degree of extension occurs and the head occupies a position midway between full flexion and complete extension, the brow or the region between the bregma and the glabella presents, giving rise to a *brow presentation*.

(4) If the extension is still more pronounced, the area between the frontal eminences and the superior maxilla presents, a condition to which we have applied the term *glabellar presentation*, as the glabella is the mid-point of the presenting part.

(5) If complete extension takes place, a *face presentation* results.

(6) Should the head be tilted towards one or other shoulder, one of the parietal bones may be leading. If the anterior parietal bone is the lowest the term *anterior parietal presentation*, or *Naegele's obliquity*, is applied. Should, however, the posterior parietal bone be the lowest, the condition is known as *posterior parietal presentation*, or *Litzmann's obliquity*.



FIG. 93.—Posterior fontanelle presentation (Roederer's obliquity).

Roederer's Obliquity

Excessive flexion of the head upon the trunk in a cephalic presentation has been termed *Roederer's obliquity*. This is nothing more than an exaggeration of the normal flexion of the head during labour,

whereby the occiput enters the inlet perpendicularly. The causes of this condition are :—

- (1) A large foetal head especially in a dead or macerated foetus.
- (2) A generally contracted pelvic inlet.
- (3) Excessive rigidity of the cervix.

Diagnosis is generally made only by a vaginal examination, when the occipital bone is felt as the most dependent part and the bregma is unusually high and cannot be reached.

Prognosis. Difficulty in the engagement of the head at the pelvic inlet causes delay in labour, but once the head is engaged condition does not usually cause dystocia. Indeed, the degree of dystocia is usually so slight that in the majority of cases labour will take a normal course. In a few cases there may be need for instrumental assistance.

Treatment. Owing to the prolongation of the stages of labour, application of forceps may sometimes be necessary to deliver the foetus.

Anterior Fontanelle Presentation

This condition is the result of a partial extension of the head, whereby the bregma or the large fontanelle becomes the most dependent part of the cephalic pole.

Ætiology. It may be due to the same causes as promote a brow or a face presentation. It is one of the important factors in the production of prolonged and tedious labour. This may be due to a longer diameter trying to engage at the brim of the pelvis and in consequence the occipito-frontal circumference, instead of the sub-occipito-bregmatic circumference is brought into relation with the pelvic cavity. Delayed internal rotation due to incomplete flexion may also cause delay in labour.

The condition is generally associated with (1) flat pelvis, (2) occipito-posterior position and (3) a relatively large head, producing conditions corresponding to a flat pelvis with a normal head.



FIG. 94.—Anterior fontanelle presentation.

Mechanism. The mechanism differs from that of a normal vertex presentation because the imperfect flexion brings the sinciput down in advance of the vertex. The occipito-frontal diameter tries to engage instead of the sub-occipito-bregmatic diameter. Engagement and descent are slow by reason of the greater circumference involved, and internal rotation of the head either fails or is accomplished with great difficulty. Labour may often come to a standstill with the occipito-frontal in the transverse diameter of the pelvic floor. The perineum may be badly lacerated and may begin to tear even before the head has reached it, because of over-distension of the vagina. Moulding of the foetal head is excessive.

Diagnosis. By a vaginal examination the large fontanelle can be palpated with ease.

Prognosis. If the condition is recognised and proper treatment adopted, the prognosis is not unfavourable. If overlooked, all the dangers of tedious labour and secondary inertia may ensue.

Treatment. Immediate correction of the incomplete flexion should be made by one of two methods :—

- (1) Pushing up the forehead during uterine contractions with two fingers in the vagina, while the other hand steadily applies pressure upon the fundus in the direction of the occiput.
- (2) The whole hand may be introduced into the vagina and either the occiput drawn down or the forehead pushed up, counter-pressure being at the same time applied upon the breech of the foetus at the fundus.

If the condition is recognised late in labour, attempts at flexion may fail. If the case requires urgent delivery application of forceps may be required.

CHAPTER XXVII

ABNORMAL CEPHALIC PRESENTATIONS

Anterior Parietal Presentation, or Naegele's Obliquity

In a case of vertex presentation during labour both parietal bones descend simultaneously and the engagement is said to be *synclitic*. If, however, one or other of the parietal bones is in advance of the other, the engagement is said to be *asynclitic*. In some cases the anterior parietal bone is in advance and the presentation is then called an *anterior parietal presentation*, Naegele's *obliquity* or *anterior asynclitism*. In other cases the posterior parietal bone leads, and the presentation is then known as a *posterior parietal presentation*, Litzmann's *obliquity* or *posterior asynclitism*.

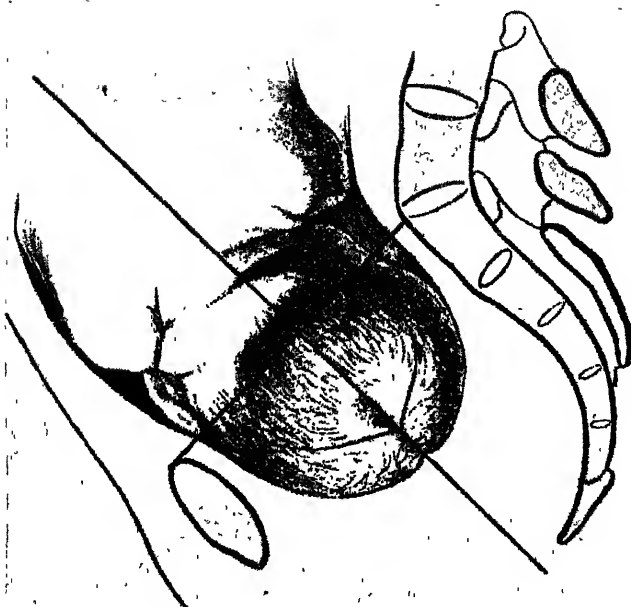


FIG. 95.—Synclitic engagement of the head.

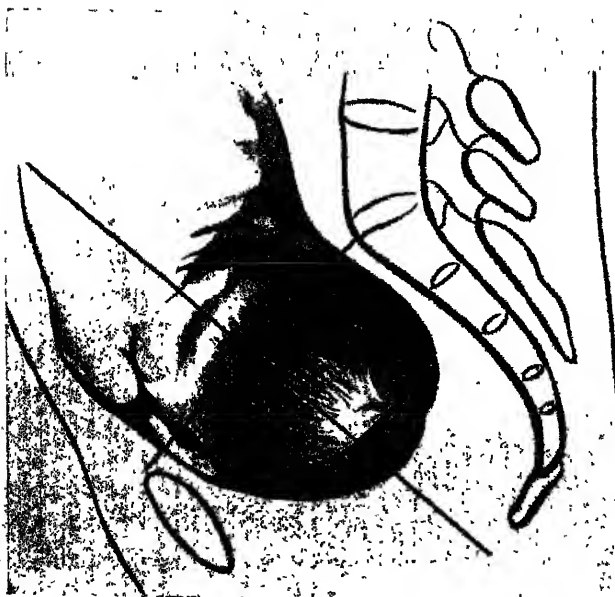


FIG. 96.—Anterior asynclitism (Naegele's obliquity).

Ætiology. Anterior asynclitism generally occurs—

- (1) Where there is a pendulous abdomen ;
- (2) In cases of flat pelvis ;
- (3) Due to any factor preventing latero-flexion of the body of the foetus.

Diagnosis is generally made by vaginal examination, when it will be noted that the sagittal suture lies nearer the sacral promontory than the symphysis pubis, and the anterior parietal bone is the most dependent part of the vertex. The position of the sagittal suture with reference to the sacral promontory is an index of the extent of the disproportion between the pelvis and the foetal head. The nearer the sagittal suture is to the sacral promontory, the greater is the disproportion.

Prognosis depends entirely upon the cause of the condition. In minor degrees of pelvic contraction the prognosis is favourable, as also when the anomaly occurs only temporarily due to causes which can easily be rectified. An anterior parietal presentation gives a much better prognosis than a posterior parietal presentation, as in the former the posterior parietal bone will slip past the obstruction of the sacral promontory much more easily than the anterior parietal which has to overcome the resistance of the symphysis pubis in cases of posterior parietal presentation.

Treatment consists in the relief of the pendulous abdomen or anteverted uterus with an abdominal support or bandage, or the treatment of any other causal factor such as contracted pelvis.

Posterior Parietal Presentation, or Litzmann's Obliquity

Here the sagittal suture approaches the symphysis pubis with the result that the posterior parietal bone or the ear becomes the presenting part. Incomplete flexion with the sinciput lower than the occiput is often present in addition. The condition usually occurs in markedly flattened pelvis. Only rarely does Litzmann's obliquity occur in a normal pelvis.

Diagnosis is made by palpating the sagittal suture by vaginal examination and noting its relative position with reference to the symphysis pubis and the sacral promontory. Where difficulty is experienced in diagnosis the whole hand has to be introduced into the vagina, when the condition above described will be readily recognised.

Prognosis depends upon the degree and variety of the pelvic contraction and is favourable in the moderate degree of contraction.

Treatment. If pelvic contraction is not present, manually correct the abnormality; usually there is associated pelvic contraction, and the appropriate treatment is that necessary to deal with the variety and degree of this contraction.

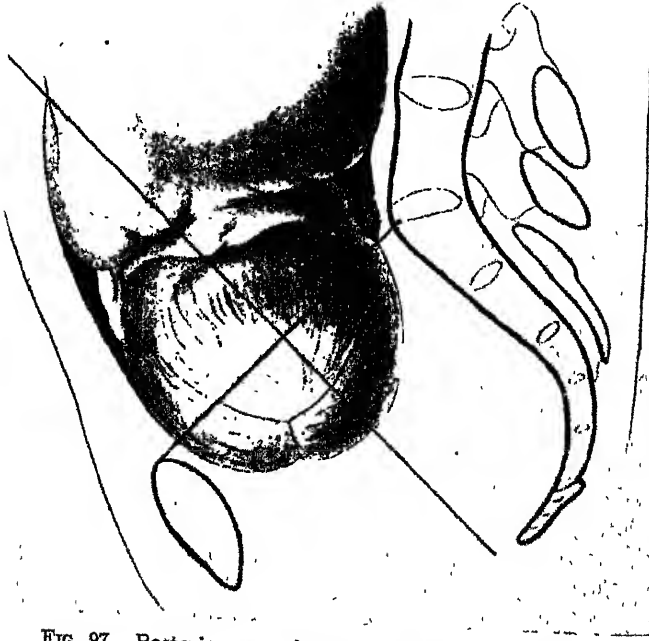


FIG. 97.—Posterior asynclitism (Litzmann's obliquity).

Brow Presentation

When that portion of the foetal head between the anterior fontanelle and the glabella forms the presenting part because of partial extension of the head, a brow presentation results. In this presentation the head lies midway between complete flexion and complete extension, and as such the brow may be observed as a transitory presentation at the beginning of labour, later becoming converted into a vertex presentation by increased flexion, or into a face presentation by increased extension, thus assuming an attitude of greater stability.

Frequency. This is fortunately one of the rarest of cephalic presentations, and at the Government Hospital for Women and Children, Madras, in a series of 20,420 cases of consecutive confinements, this presentation occurred in 8 cases, or 1 in 2552 cases.

Ætiology. All factors which cause deflexion of the head may favour a brow presentation. Thus, the factors concerned in such deflexion attitudes may be classified under the following headings :—

(a) *Faults in the Passages :—*

- (1) Contractions of the pelvis.
- (2) A pendulous abdomen.
- (3) Obliquity of the uterus.
- (4) Tumours of the lower segment of the uterus.
- (5) Placenta prævia.
- (6) A loaded rectum or a distended bladder.

(b) *Factors associated with the Passenger or Fœtus :—*

- (1) Hydramnios.
- (2) Congenital dolichocephalic head.
- (3) Tumours of the neck of the fœtus.
- (4) Cord several times round the neck.
- (5) Spasm of the muscles of the neck of the fœtus.
- (6) Prematurity or death of the fœtus.
- (7) An abnormally big or a very small fœtus.
- (8) Anencephalic fœtus.

(c) *Faults in the Forces :—*

Weak uterine contractions at the commencement of labour.

Positions. Although in a brow presentation it is possible for the fœtus to lie in one of six positions, as in a vertex, clinically only two positions are recognised :—

- (1) Where the back is to the right ; and
- (2) Where the back is to the left.

Diagnosis. On palpation by the second pelvic grip and Pawlik's grip, the head will be found in the lower pole of the uterus. By careful examination it will be noted that the sinciput and the occiput are on the same level and that the presenting part does not engage in the brim of the pelvis or only attempts to engage late in labour. A vaginal examination will reveal certain signs indicative of abnormal presentation, together with other signs diagnostic of this particular abnormality viz Brow presentation.

Signs suggestive of Abnormal Presentation. In all cases where the presenting part does not fill the brim of the pelvis and a free communication therefore exists between the forewaters and the afterwaters, certain signs pointing to the presence of an abnormal presentation will be made out on vaginal examination. Such signs

may be found in brow, face, breech or shoulder presentations, and in those cases of vertex presentations where the head does not engage in the brim of the pelvis after the onset of labour because of disproportion, a malposition or even an abnormal attitude. These signs are :—

- (1) A cone-shaped bag of membranes felt when the cervix has dilated sufficiently.
- (2) Premature rupture of the membranes.
- (3) The cervical os dilating slowly and often never reaching completion.
- (4) After rupture of the membranes the cervix not taken up and the cervical lips remaining thick and hanging loosely.
- (5) The presenting part high up and difficult to reach with the fingers by vaginal examination.
- (6) Occasionally presentation of the cord, or after rupture of the membranes, prolapse of the cord may be met with.

Signs indicative of the Particular Abnormal Presentation. In a case of brow presentation these signs consist in recognising certain bony landmarks and soft parts.

The bony landmarks are the supraorbital ridges, the frontal eminence and the glabella. The soft part is the anterior fontanelle which is a lozenge-shaped space from which four sutures radiate, namely, the sagittal, the two halves of the coronal and the frontal and four bones meet, namely, the two parietal bones posteriorly and the two frontal bones anteriorly.

If therefore it is possible to make out the supraorbital ridges at one end of the presenting part and the anterior fontanelle at the other end the presentation is a brow.

Mechanism. A brow presentation in the great majority of cases, owing to its instability, converts itself early in labour into a face or a vertex presentation. If it persists, progress will usually be arrested where the pelvis is of normal size and the child at term is normally developed, because the diameter of engagement in a brow presentation is the longest diameter of the foetal head—the vertico-mental—which measures 5½ ins. In cases, however, where the pelvis is either big or the foetal head is small owing to prematurity, moulding may take place and the brow slowly descends into the pelvis, rotates towards the symphysis pubis and the maxilla becomes fixed under it. Flexion then takes place and the brow, the bregma and the vertex are born in succession. The occiput now drops over the perineum and the face and chin appear.

from underneath the symphysis pubis. After delivery of the head, shoulder rotation and restitution occur as in a vertex presentation.

Prognosis. The prognosis for both mother and foetus is unfavourable unless assistance is available and proper treatment is adopted. The dangers to the mother are exhaustion from an obstructed labour, severe laceration of the parturient canal, including rupture of the uterus which may follow tonic contraction if assistance is not available in time, shock and sepsis, the result of the prolonged labour and necessary interference.



FIG. 98.—Engagement of the head in a brow presentation.

The dangers to the child are excessive moulding and compression of the skull causing intracranial injuries, asphyxia due to prolapse of the cord, or interference with the placental circulation



FIG. 99.—Moulding and caput in brow presentation.

by abnormally strong and frequent uterine contractions, together with the incidental dangers of the operative measures that may be needed.

Management. Spontaneous delivery of a brow presentation should never be counted on. It is not justifiable to hope for spontaneous rectification to occur, and it is therefore the duty of the obstetrician to interfere as early as possible once a diagnosis of brow presentation is made.

The first thing to determine is the cause of the brow presentation. If it is the result of contracted pelvis or a pelvic tumour, attention must be directed to the causative factor and a suitable method of treatment adopted for it. In some of these cases where there is gross disproportion it is desirable to do a Cæsarean section as vaginal modes of delivery are out of question. Should, however, the brow presentation not be due to any such factors, the treatment will depend upon the stage of labour at which the woman comes under observation.

(a) *If the woman is seen early in Labour, before the Cervix is dilated and the Membranes have ruptured.* The position may be corrected by abdominal manipulation, in a manner similar to that to be described under face presentation. A vertex presentation is thus brought about, a tight abdominal binder is applied and the further course of labour left to nature.

(b) *Membranes entire Cervix Two-fifths dilated.* Two methods of treatment are available:—

(i) Conversion into a vertex by combined internal and external manipulation. Between the pains, the sinciput is pushed up by two fingers in the vagina while at the same time a hand on the abdominal wall presses the chest of the child backwards so as to favour the production of an attitude of complete flexion.

(ii) Wherever possible we recommend the conversion of a brow into a breech presentation as the most suitable method of treatment and one which avoids complications at a later stage in labour. When the membranes are entire this can be attempted by external or hipolar podalic version the head being pushed upwards, while simultaneously the other hand pushes the breech down towards the pelvis. The details of these procedures will be more fully dealt with in the chapter on version.

(c) *If the Membranes have ruptured, the Os is nearly fully dilated and the Brow not engaged.*

Attempts at favouring complete flexion by pushing the sinciput up or the occiput down may be tried, or as an alternative, if the chin is more anterior, the occiput may be pushed up and a face presentation brought about. A face presentation, although an abnormal presentation, has a much more favourable prognosis both for the mother and the child as long as the chin is anterior.

Once the brow has been converted into a face or vertex presentation, labour should be allowed to progress spontaneously, and only when signs of foetal or maternal distress manifest themselves is it necessary to consider interference. Internal podalic version and extraction affords a quick method of terminating labour when the cervix is fully dilated.

(d) *If the patient is seen late in labour*, when the brow has partially descended into the pelvis and the uterus is tonically contracted, version is contraindicated as it would precipitate rupture of the uterus. The methods of treatment then available are :—

- (i) If the chin is posterior conversion under deep anaesthesia into a vertex presentation by pushing the sinciput up or bringing the occiput down with the half hand introduced into the vagina.
- (ii) When the chin is anterior conversion into a face presentation by pushing the occiput up.
- (iii) In rare cases, forceps may be applied and gentle traction attempted as when the head is relatively small it may succeed. Care must be taken, however, not to use great force.
- (iv) If the child is dead, craniotomy.

We do not advocate symphysiotomy or pubiotomy in such cases, as at the late stage at which these patients are seen the risks are great for the mother and the chances of survival of the foetus remote.

In a few cases, it is possible to perform a lower segment Caesarean section and deliver a living child. The conditions under which this operation may be performed and the contraindications will be dealt with in the chapter on Caesarean section.

Face Presentation

This is the result of complete extension of the head and occurs in about 1 in 250 cases. In face presentation the chin is the denominator and that part of the cephalic pole which lies between the chin and the frontal eminence tries to engage in the pelvis.

Face presentation may be either primary or secondary. It is primary when it exists before the onset of labour, and secondary

when it develops during the course of labour as a result of obstruction to the proper engagement of the head at the brim of the pelvis.

Ætiology. Among the factors responsible for the causation of a primary face presentation are :—

- (a) Intrinsic factors connected with the fœtus, such as anencephaly, dolichocephalic head, tumours of the neck and cord several times round the neck.
- (b) Extrinsic factors, for example contractions of the pelvis, obliquity of the uterus.

Secondary face presentation is more likely to occur in cases where, owing to the difficulty in engagement of the head, the cephalic pole is in a state of unstable equilibrium and the sinciput tries to descend in advance of the occiput, thereby favouring extension. Among the contributory causes for this condition are :—

- (1) Contractions at the brim of the pelvis.
- (2) Obliquity of the uterus.
- (3) Disproportion between the head and the pelvis, owing to the large size of the head.
- (4) Tumours in the region of the brim of the pelvis.
- (5) Pendulous abdomen.

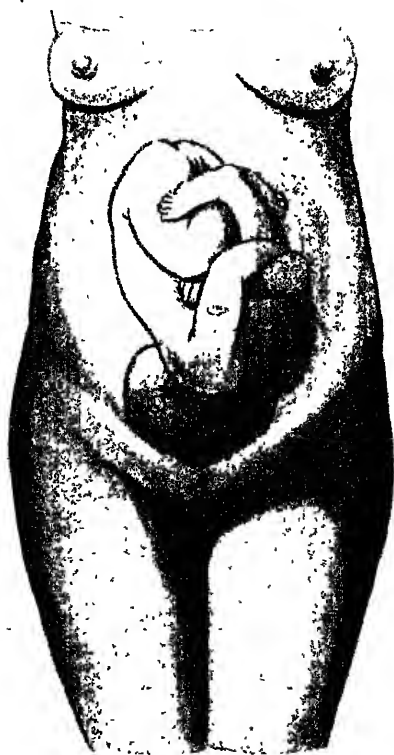


FIG. 100.—Face presentation.

Positions. As in a vertex presentation we can differentiate six positions in a face presentation. The chin being the denominator the positions are :—

(1) Right mento-posterior	(R.M.P.)	corresponding to	L.O.A
(2) Left mento-posterior	(L.M.P.)	„	R.O.A
(3) Left mento-anterior	(L.M.A.)	„	R.O.F
(4) Right mento-anterior	(R.M.A.)	„	L.O.F
(5) Left mento-transverse	(L.M.T.)	„	L.O.T
(6) Right mento-transverse	(R.M.T.)	„	R.O.T

It will be noticed that the position of the back of the foetus in relation to the maternal pelvis is the same in the corresponding positions of face and vertex, and the only difference is complete extension instead of flexion of the head. The commonest position of a face presentation are right mento-posterior (R.M.P.) and left mento-anterior (L.M.A.).

Diagnosis. Occasionally the shape of the uterus may give an important indication, especially when the back is posterior the limbs are pushed prominently to the front against the anterior wall of the uterus and the abdominal wall. By *abdominal palpation* in Pawlik's grip or the second pelvic grip, a hard round prominence the occiput, is felt separated from the back of the child by a deep groove. If an attempt is made to feel the relative position of the occiput and the sinciput it will be found that the occiput is always at a higher level than the sinciput. The hoof-like chin can be recognised easily, particularly if the back is posterior. When the head has descended, the prominence of the occiput to one side and difficulty in palpating the back of the foetus, together with the resistance of the chin felt on the opposite side, will indicate that the presentation is a face.

Auscultation will reveal the foetal heart to be best heard below the umbilicus. When the back is posterior the foetal heart sounds are heard with great distinctness, and with a thin abdominal wall it may occasionally be possible to palpate the heart-beats.

Vaginal Examination. The signs of abnormal presentation already referred to under brow presentation are found in a face presentation as well, early in labour. When the membranes have ruptured, it is possible to make out certain bony landmarks and soft parts. The bony landmarks are :—

- (1) The hoof-like chin.
- (2) The malar eminence on either side of the face.
- (3) The supraorbital ridges.

The soft parts felt are the nose and the mouth recognised by—

- (a) The alveolar ridges.
- (b) The tongue.
- (c) Occasionally the sucking movements may be noted.

The only other presentation with which a face is a breech presentation. A careful examination of the points of differential diagnosis.

Differential Diagnosis between Face

FACE.

Chin, malar eminences and supra-orbital ridges can be made out as hard bony landmarks.	The ischial and sacrum
The mouth can be recognised by the alveolar ridges, the tongue and the sucking movements.	Anal canal gripping sphincter the alveolar
The finger introduced into the mouth may not be soiled.	Pure meconium on the finger introduced into
On deep vaginal palpation the ear may be made out.	On deep palpation the groin is
	The external os in the mouth out.

We do not think any real difficulty should be experienced in differentiating a face from a breech, except when the part is very high up early in labour and the fingers are not used. In such cases, if a doubt exists a thorough examination under anaesthesia.

Occasionally, late in labour, excessive caput tends to obliterate landmarks, but care can prevent any mistake in diagnosis.

Care must be exercised in making internal presentations, so as to avoid damage to the face as well as lacerations of the face. It is also dangerous to introduce the finger into the mouth as it may provoke the part of the child.

Mechanism. The part played by the face in presentation is simulated by the chin in a face presentation. The movements which help to deliver the face are—

- (1) Descent with increased extension.
- (2) Internal rotation of the chin.

- (3) Flexion.
- (4) Restitution.
- (5) External rotation.



FIG. 101.—Delivery of the face in a face presentation.

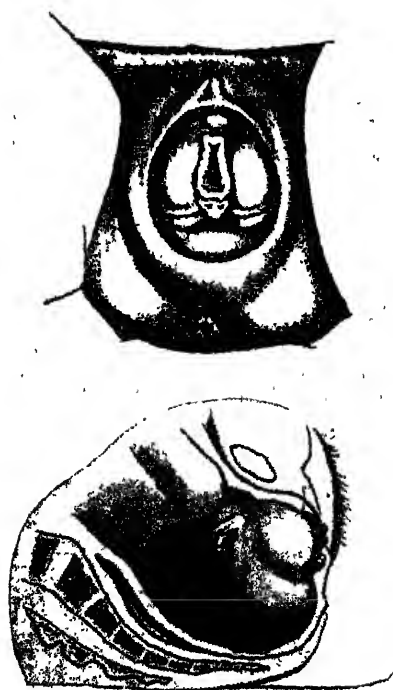


FIG. 102.—Mechanism of delivery in a face presentation.

At the beginning of labour the head is fairly high and may not always be in an attitude of complete extension. When labour starts and descent begins, an exaggeration of extension takes place. The chin becomes the most dependent part and the face engages by its cervico-bregmatic diameter in one or other of the oblique diameters of the pelvis. As the head descends the chin meets the pelvic floor first and anterior rotation of the chin occurs so as to bring it well underneath the symphysis pubis. After it becomes fixed there, flexion occurs. As a result of this, the mouth, nose, forehead and sinciput escape sweeping over the perineum. As soon as the head is delivered restitution takes place, as in a vertex presentation, and external rotation of the head corresponding to the movement of internal rotation of the shoulders. The rest of the body is delivered thereafter.

In cases where the chin is anterior at the time of the onset of labour, internal rotation takes place through one-eighth of a circle; where the chin is posterior, as in right mento-posterior and left mento-posterior positions, the chin rotates through the larger arc of the circle, that is, through three-eighths of a circle (135°).



FIG. 103.—Impacted mento-posterior.

Abnormalities may occur in the rotation. The chin may not rotate at all, or it may be arrested at any stage in the movement of internal rotation, or again the chin may rotate into the hollow of the sacrum. Accordingly, in a case of face presentation where the chin is posterior, the chin may be felt at one of four positions:

- (1) In the hollow of the sacrum directly posterior.
- (2) Opposite a sacro-iliac synchondrosis,

- (3) At one end of the transverse diameter of the pelvis.
- (4) Opposite the acetabulum, that is 45° from the symphysis pubis.

When the chin remains posterior, further efforts at delivery only impact the face more tightly, as with each attempt to push the head down a portion of the neck and body of the foetus is also pushed down simultaneously, so that the diameter of the engaging part becomes increased by the thickness of the chest of the foetus.

The difference between a persistent mento-posterior and a persistent occipito-posterior is therefore obvious, that whereas natural efforts by forcible uterine contractions may succeed in effecting delivery in a case of persistent occipito-posterior, in a case of persistent mento-posterior they will never succeed in effecting delivery. A favourable termination is not therefore possible, and if no help is available, the foetus dies from asphyxia and the mother from rupture of uterus or exhaustion.

Clinical Course. Most cases of face presentation with the chin anterior are delivered by natural efforts, as in these cases the diameter of engagement, the submento-bregmatic, is equivalent in length to the suboccipito-bregmatic, which engages in a vertex presentation. If, therefore, there be no disproportion between the head and the pelvis due either to contraction of pelvis or to the increased size of the head, a face presentation if the chin is anterior is generally delivered spontaneously. The possibilities of premature rupture of the membranes and prolapse of the cord should, however, be borne in mind.

As with abnormal presentations, in general, premature rupture of membranes may lead to imperfect dilatation of the cervix, draining of the liquor amnii, with the accompanying dangers of a dry labour and prolongation of the first and second stages.

When the chin is posterior, however, reverse rotation of the chin may take place, and then further progress is impossible.

Prognosis.—Mother. The risks to the mother are increased owing to the following factors:—

- (1) Prolongation of the stages of labour due to the factors concerned in the causation of the face presentation and possibly premature rupture of the membranes
- (2) The frequent vaginal examinations to ascertain the progress of labour.
- (3) The greater necessity for instrumental or manipulative interference.
- (4) The dangers incidental to persistent mento-posterior positions.

Child. Here the prognosis is definitely worse. The foetal mortality in face presentations varies between 10 and 15 per cent., as compared with a mortality of 2 to 3 per cent. in vertex presentations. The causes of these increased risks are :—

- (1) Prolapse of the cord.
- (2) Prolonged uterine pressure after premature rupture of the membranes.
- (3) Faulty mechanism in delivery, such as unrotated mento-posterior positions.
- (4) The operative interference necessitated.
- (5) Vaginal examinations may cause damage to the face and if sufficient care is not taken the eyes may be seriously injured.
- (6) Frequently, owing to the caput that is formed about the mouth and face, and possibly also because of a certain amount of œdema of the larynx and trachea, the child is unable to cry lustily and often has a hoarse voice for two to three days after delivery, and for the same reason, is not able to suck at the breast during that period.



FIG. 104.—Caput in face presentation.



FIG. 105.—Caput and moulding in face presentation.

Management. The treatment of this condition depends upon the stage at which the malpresentation is recognised. The case may be met with :—

- (a) In the last weeks of pregnancy.
- (b) Early in labour before rupture of the membranes with the presenting part not engaged.

(c) Before rupture of the membranes, after engagement of the presenting part.

(d) After rupture of the membranes.

We shall now consider in detail the methods of treatment available at each of these stages :—

(a) *Woman seen in the Last Weeks of Pregnancy with a Face Presentation.*

In such cases ascertain the cause of the face presentation.

If the pelvis is contracted, the proper method of treatment depends upon the type and degree of contraction. In all cases of abnormal presentation we recommend that this factor should be borne in mind and a careful investigation made to recognise contractions of the pelvis. The malpresentation in such cases is a secondary factor and should help to focus our attention on the nature of treatment required for the primary factor, namely, the contracted pelvis.

Where there is no contraction of the pelvis, the question to be decided is whether any interference is called for. We hold that if the chin is anterior in a face presentation, none is required. For

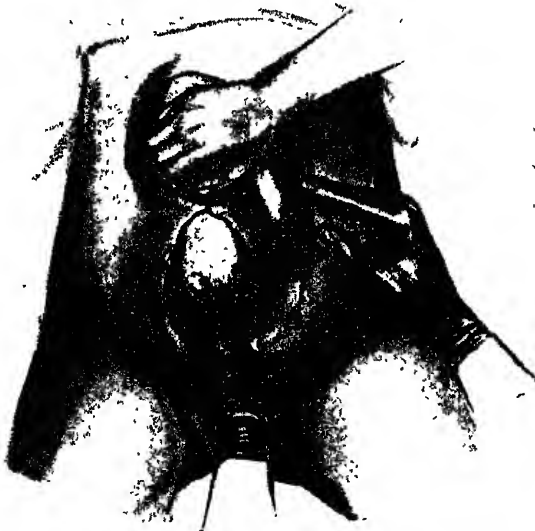


FIG. 106.—Conversion of a face into vertex by combined manœuvres.

the reasons already stated the clinical course of labour in a mento-anterior position does not differ materially from that of an occipito-anterior position.

If the chin is posterior it may be possible to change the presentation into a vertex by external abdominal manipulation

according to the method described by Schatz. The advantage of converting it into a vertex presentation is obvious because a mento-posterior position, when converted into a vertex, becomes an occipito-anterior position; in other words, the most unfavourable position in a face presentation is converted into the most favourable position in a vertex.

Schatz's manœuvre, or the method of converting a face into a vertex presentation, consists of three manipulations.

- (1) Raise the presenting part above the brim of the pelvis so that it is freely movable.
- (2) By abdominal manipulation press the chest of the foetus towards the back with the palm of one hand, while the other hand is used to push the breech in the opposite direction.
- (3) By fundal pressure push the breech down in the direction of the occiput.



FIG. 107.—Schatz's manœuvre.

This will promote flexion of the head and the conversion of the face into a vertex presentation. After conversion a tight abdominal binder may be applied.

Schatz's manœuvre is often not successful, due to thickness of the abdominal wall of the mother or the want of laxity of the uterus. Besides, it must be remembered that incomplete reduction

results in a brow presentation. For these reasons we have not adopted this method as a routine in the treatment of mento-posterior cases and prefer to leave the woman alone, advising her to report to us as soon as labour starts.

(b) *Early in Labour, before Rupture of the Membranes and when the Presenting Part is not engaged.*

Here, three courses are open to us :—

- (1) To leave the case to progress without any interference—a method which we would certainly adopt where the chin is anterior. The woman must, however, be told not to walk about in the first stage of labour, and every effort should be made to prevent early rupture of the membranes.
- (2) To try and convert the face into a vertex presentation by the external manipulative measures already described as Schatz's manœuvre especially in mento-posterior cases.
- (3) To convert the face into a breech presentation. The conversion of the face into a breech presentation is useful in mento-posterior cases.

(c) *Before Rupture of the Membranes but after engagement of the Presenting Part.*

In such cases it is well to allow plenty of time for labour to progress so that the chin may rotate anteriorly. As in occipito-posterior cases we favour the patient lying on the side to which the chin is pointing, with a view to help forward rotation. The descent of the chin takes time, and till it has reached the pelvic floor it cannot rotate forwards and hence early rotation cannot be expected in cases of mento-posterior positions.

In some cases when the cervix is about three-fifths dilated and the chin is posterior, it may be possible under an anæsthetic, gently to dislodge the presenting part and perform Bipolar Version and leave the rest of the delivery to take place spontaneously.

(d) *After Rupture of the Membranes.*

Besides the partial escape of liquor amnii, the possibilities are :—

- (1) The face may descend, the chin rotate anteriorly and the child be born spontaneously.
- (2) The face may be arrested at the brim.
- (3) The face may descend and be arrested in the cavity of the pelvis at various stages in the movement of forward rotation.
- (4) The face may descend and the chin rotate posteriorly and so become a persistent mento-posterior case.

1. *Spontaneous Delivery.* This is to be expected in uncomplicated cases of face presentations where the mentum is anterior. In the presence of good uterine contractions the natural tendency is for the face to engage and pass through the pelvic cavity with the movement of internal rotation which brings the chin under the symphysis pubis. In some cases of mento-posterior position also, the chin may rotate forward and be born by natural efforts. It is therefore worth while in such cases to watch carefully and note the advance of the face and more particularly the advance of the chin anteriorly in the movement of internal rotation.

2. *The Face arrested at the Brim.* The possibilities of disproportion should always be borne in mind in such cases. Where such disproportion exists the treatment will depend, as has been indicated above, on the degree of disproportion. Where, however, the pelvis is not contracted, internal podalic version offers a safe method of delivery. The advantage of version over other methods of treatment in such cases lies in the fact that after a successful podalic version the risks to the mother are negligible, and with a moderate amount of experience the risks to the child are less than by any other mode of treatment.

Another method of treatment when the face is arrested at the brim consists in attempting to convert it into a vertex presentation. This may be done by one of two manœuvres :—

- (a) The half hand may be introduced into the vagina, preferably with the woman under chloroform, and slipped behind the occiput and the occiput drawn down, while simultaneously the other hand applied on the anterior abdominal wall against the chest of the foetus presses it in the opposite direction. Once the conversion into a vertex has been effected, a tight abdominal binder is applied and the further course of delivery left to nature unless indications for interference arise on behalf of either the mother or foetus.
- (b) In some cases it may be advantageous to press the sinciput upwards by two fingers introduced into the vagina, at the same time the hand on the anterior abdominal wall presses against the occiput and tries to push it downwards. When the occiput has been pushed down sufficiently an assistant can complete the process by pushing down the body of the foetus from the fundal pole to promote complete flexion of the head. The subsequent course of labour will be the same as stated above.



FIG. 108.—Playfair-Partridge method of converting face into vertex.



FIG. 109.—Conversion of face into vertex by internal manipulation.

(Baudelocque's method.)

Theoretically these methods appear to be excellent and would seem to afford a very satisfactory means of converting an unfavourable presentation, into a favourable one. In practice, however, they are not easy to accomplish, and occasionally a brow presentation may result by the failure to secure complete flexion by either of the two manipulations. It is for these reasons that we prefer, wherever possible, to convert a face when the chin is posterior into a breech presentation.

In some cases the question of Cæsarean section may have to be considered when the child is alive, and in such cases the precautions and contraindications that will be stressed later in connection with Cæsarean section will have to be borne in mind.

3. *The Face arrested in the Pelvic Cavity.* A not infrequent cause of arrest of the face in the cavity is weak uterine contractions. In such cases, particularly if the chin has entered the anterior quadrant of the pelvis, the uterus can be stimulated to contract by small doses of pituitary extract, $\frac{1}{8}$ to $\frac{1}{4}$ c.c. In all probability this will help to complete internal rotation and effect delivery of the foetus. If it does not succeed forceps may be applied and the child delivered, provided the cervix is fully dilated.

Where, however, delay is due to an imperfect rotation in a mento-posterior position, the case requires more energetic treatment. Time should however be given for spontaneous internal rotation of the chin to occur which, both from the point of view of the mother and the child, offers a much better prognosis than will accrue from undue haste in interference. For these reasons the foetal heart must be watched carefully, the mother's condition noted and the state of the uterus followed. Where, however, signs of foetal distress manifest themselves or are likely, internal rotation may be assisted by the introduction of the half hand into the vagina to grasp the chin and rotate it forward. This is known as Madam La Chapel's manœuvre and does succeed in many cases if the face is not actually jammed in the pelvis.

The forceps may sometimes be applied immediately after rotation of the chin by the half hand which keeps it in the position to which it has been rotated, while the blades are slipped into position by the other hand.

If the chin does not rotate in spite of these manipulations, we believe that forceps can be applied, traction made and anterior rotation favoured by slightly rotating the forceps. Considerable difference of opinion exists as to whether the forceps should be used as a rotator in cases of mento-posterior positions. We are fully aware of the dangers and the risks incidental to such rotation, particularly for the foetus; but we believe that where the chin is

lying in the transverse diameter of the pelvis and especially if it is not tightly jammed, careful rotation of the forceps to a slight extent to carry the chin anteriorly beyond the transverse diameter of the pelvis will help considerably in the course of the further delivery. It is a mistake to rotate the chin completely anteriorly and to bring it underneath the symphysis pubis by the forceps alone. What should be attempted when the forceps is used as a rotator is to dislodge the chin from the place where it is fixed and to rotate it through 45° so as to favour the completion of rotation.

If all attempts at forward rotation of the chin fail and the chin is posterior, or reverse rotation of the chin has already taken place, no useful purpose will be served by trying to drag the head through the pelvis. The chances of delivering a live child or one that is capable of surviving are remote, and in such cases craniotomy is justifiable. In performing craniotomy in a mento-posterior position the forceps should be applied and the perforator passed either through the mouth or through the orbit into the cranium. After destroying the brain, traction by the forceps helps to reduce the size of the foetal skull and gradually to deliver it.

We have not discussed the place of symphysiotomy or pubiotomy in the treatment of mento-posterior complications, because we feel that such a procedure is inadvisable as it is attended with grave risks to the mother and with doubtful chances of delivering a live child.

To sum up, face presentations may be left to nature so long as the chin is anterior and in the absence of any complications.

Where the chin is posterior efforts should be made to rotate the chin anteriorly, and so favour spontaneous delivery or help with the application of forceps.

If conditions are favourable, podalic version is a safer method of procedure in the interests of the mother and very often in the interests of the child as well.

Where internal rotation of the chin is not possible, occasionally the forceps may be used as a tractor and also as a gentle and partial rotator, the rest of the rotation being favoured either by the use of the hand or just left to nature.

Where, however, the chin is persistently posterior and rotation fails, or reverse rotation of the chin has occurred and the face is jammed in the pelvis, it is wiser to perform craniotomy and deliver the foetus.

Cæsarean section must be the method of choice in certain select cases; but symphysiotomy and pubiotomy are not to be advocated in cases of mento-posterior position.

Glabellar Presentation

In some cases hitherto classified as face presentations it has been noticed that the head lies in a position of partial extension midway between a brow and a face. These cases are not infrequently mistaken for a face presentation; for, if a vaginal examination be made, the finger would reach the chin, and the mouth and orbital ridges can be felt. A closer examination, how-



FIG. 110.—Glabellar presentation.

ever, will make it clear that the chin is not easily within reach, and if the examination be confined to the actual part presenting, the supra-orbital ridges, the glabella, the malar eminences and the anterior maxillary bone will be palpated. To such a presentation the term "glabellar presentation" has been given, because the glabella is the mid-point of the presenting area. The diameter of engagement in such cases is the mid-supramaxillary vertical diameter, which is the distance between the mid-point of the orbital ridge of the superior maxilla and a point midway between

the two fontanelles. By actual measurement of a number of cases it has been found that this diameter varies between 4 and 4½ ins.

The striking point about this presentation is that there is no caput formation on the chin and the lower lip, nor is there any trace of it over the anterior fontanelle. The caput forms mostly on the supra-orbital ridges, the glabella, the malar eminences, the eyelids and the upper lip.

The mechanism of delivery is almost similar to that of a face presentation, except that instead of the chin the upper jaw is the denominator. In cases where the upper jaw rotates to the front, delivery may be spontaneous. Occasionally help with forceps may be necessary. In some cases, however, there may be considerable delay and the presenting part may not descend. In such cases the method of treatment to be adopted is to convert it into a full face presentation and aid anterior rotation of the chin, or if the head is still high up, to perform internal podalic version and deliver the child, provided the conditions are favourable for such an operation. Where, however, glabellar presentation has become jammed in the pelvis and the foetal heart is not audible, perforation through the mouth is necessary before effecting delivery.

The prognosis is a little more unfavourable so far as the child is concerned than in a face presentation. It need not be worse for the mother if suitable precautions are taken.

CHAPTER XXVIII

PELVIC PRESENTATIONS

HITHERTO we have been dealing with cephalic presentations; we shall now consider podalic or pelvic presentations where the podalic pole of the foetus is found at the brim of the pelvis.

Varieties. There are two varieties of breech presentation:—

- (a) Complete. (b) Incomplete.

Complete breech is one where the foetus maintains the attitude of universal flexion as in a normal vertex, but with the difference that the lower or pelvic pole of the foetus presents at the brim of the pelvis.

In cases of *incomplete breech*, on the other hand, the attitude of universal flexion is disturbed and varying degrees of extension occur at the podalic pole. Thus one may meet with cases of:—

- (a) *Frank breech* or *extended breech*, where both the thighs are flexed, but the legs are extended so that the lower limbs lie along the ventral surface of the child's trunk.

- (b) *Knee presentation*, where the thigh is extended but the leg is flexed.
- (c) *Footling presentation*, where the thigh is extended at the hip and the leg is extended at the knee.

In knee and footling presentations both the extremities may be involved or only one of them.

Frequency. The frequency of breech presentations is variously estimated, but it may be said that they generally occur once in about fifty cases. At the Government Hospital for Women and Children, Madras, there occurred 492 cases of breech out of a total number of 20,420 consecutive confinements, giving a proportion of 1 in 42 deliveries.

Ætiology. Anything which interferes with the normal shape of the foetal ovoid or changes the shape of the uterine ovoid may result in a malpresentation, such as breech. The factors favouring a breech presentation are :—

- (1) *Faults in the Passages and Forces.* Obliquity of the uterus; relaxation of the uterine and abdominal walls; abnormal mobility of the uterus, particularly in women who have borne many children; uterine fibroids; placenta prævia; ovarian tumours; contractions of the bony pelvis.
- (2) *Faults in the Passenger (Fœtus).* Hydramnios, prematurity, multiple pregnancy, monstrosities, foetal anomalies such as hydrocephalus, hydrothorax, ascites, distended bladder, dead and macerated fœtus.

We frequently see the co-existence of several of these factors in a given case.

Positions. Four positions are described. The sacrum is used as the denominator in breech presentation, and depending on the position of the sacrum a breech may present as :—

- (1) Left sacro-anterior (L.S.A.), which is the commonest.
- (2) Right sacro-anterior (R.S.A.).
- (3) Right sacro-posterior (R.S.P.).
- (4) Left sacro-posterior (L.S.P.).

It will be seen that these positions correspond with the relative positions in a vertex presentation, except that instead of the occiput the sacrum is below at the brim of the pelvis.

Mechanism of Labour. The breech enters the brim of the pelvis with the bis-iliac diameter in one or other of the oblique diameters. In the left anterior position it is the left oblique diameter; in the right anterior position it is the right oblique diameter.

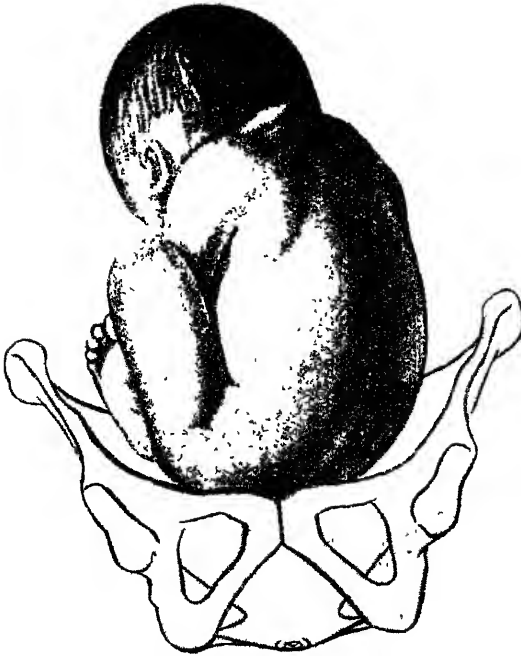


FIG. 111.—Breech presentation, L.S.A.



FIG. 112.—Breech presentation, R.S.P.

Before labour commences the breech does not enter the brim of the pelvis as the cephalic pole would, so that the presenting part is felt higher up and not engaged. When, however, labour starts the first movement is descent with compaction. *Compaction* means that every part of the body becomes a little bit more flexed, the same movement in reality that takes place in a vertex presentation where the increased flexion permits a smaller diameter to engage in the brim of the pelvis. This descent with compaction drives the breech down through the pelvis till the anterior buttock reaches



FIG. 113.—Breech presentation with one leg extended.

the floor of the pelvis when the second movement takes place, namely, *internal rotation*. It always results in the anterior buttock moving towards the symphysis pubis through one-eighth of a circle; whether the sacrum is in the anterior or posterior position there is always one buttock anteriorly which can move through one-eighth of a circle and thus bring the buttock to the symphysis pubis. After internal rotation has taken place the next movement is *latero-flexion*. This movement is in reality the counterpart of the movement of extension in a vertex and flexion in a face presentation. The need for latero-flexion will be realised when it is stated that it is only by this movement that the breech is able to pass through

the cavity and present at the outlet. The breech then distends the perineum and is born. Once the breech has been delivered outside the vagina the body slips out; the shoulders now engage in the same oblique diameter as the buttocks engaged in, and by the movement of internal rotation the anterior shoulder hitches against the symphysis pubis, the posterior shoulder sweeps over the perineum and is born first, the anterior shoulder following later. After descent of the shoulders the head engages in the opposite oblique diameter; if the breech had passed through the left oblique diameter the head would engage itself in the right oblique diameter.

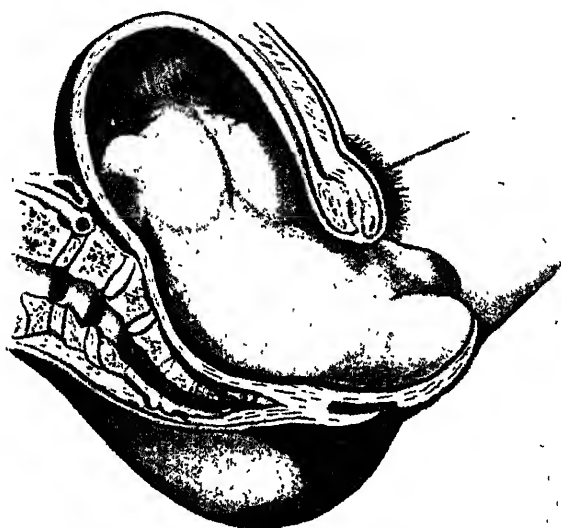


FIG. 114.—Mechanism of delivery in a breech. Latero-flexion.

Rotation takes place, bringing the occiput underneath the symphysis pubis, and then by a movement of flexion the head is born.

The mechanism of a breech presentation, therefore, is a little more complicated than the mechanism of a vertex or a face presentation. The head like the breech has to go through a mechanism before it can be born, namely, internal rotation, with increased flexion. In fact the mechanism in breech delivery consists of three stages: delivery of the breech, delivery of the shoulders and delivery of the head. Occasionally, when the back is posterior, the movement of internal rotation of the breech carries the body sometimes to the opposite oblique diameter; in other words, when the back is posterior the anterior buttock rotates not merely through one-eighth of a circle but through one-fourth of a circle to the opposite side, and the back which was posterior becomes

anterior, so that the further stages of delivery present no difficulty. Sometimes the after-coming head in a posterior position fails to rotate with the trunk anteriorly, and so adopts a persistent occipito-posterior position. If the head is small and spontaneous delivery is possible the face slips down behind the symphysis pubis and the chin is born first, but usually labour is held up.

Diagnosis.—**Abdominal Palpation.** On palpation, unless the patient is unduly fatty or the muscles held rigid, or the uterus is contracting strongly, the cephalic pole will be felt at the fundus of the uterus and can be differentiated from the breech in that position by the fact that the head is smaller, harder, more movable and ballottes independently of the rest of the body, and in some cases the occiput and the chin can be distinctly felt. Umbilical grip will reveal the presence of the back on one side and the limbs on the other. By means of the pelvic grips the large breech is felt at the lower pole, and it can be recognised as such since it moves with the rest of the body and is softer than the head.

Auscultation is also of considerable help. The foetal heart will be heard above the level of the umbilicus either to its right or left, depending upon the position of the back. It will be heard nearer the middle line, when the back is anterior and further out when the back is posterior.

Vaginal Examination. Early in labour vaginal examination will reveal all the signs suggestive of an abnormal presentation already referred to, namely, the cone-shaped bag of membranes, imperfect dilatation of the os, the presenting part fairly high up, and if the membranes have ruptured prematurely, as they often do, the cervical edges hanging loose and fringe-like.

Later in labour, a breech is made out on vaginal examination by the recognition of certain bony landmarks and soft parts. The ischial tuberosities on either side and the sacrum behind may be felt. The finger may feel the external genitalia and occasionally the sex of the foetus may be ascertained. The anal aperture may also be made out on the introduction of the finger, when it will be noted that the sphincter grips the finger which is stained by pure meconium. Sometimes the feet may be made out or the knees. If the finger is passed fairly high up the groove of the groin may also be felt. In cases of difficulty or doubt when a breech is high up it is well to give the patient an anaesthetic and introduce the whole hand into the vagina, to make out the exact nature of the presentation.

The breech may sometimes be mistaken for a face presentation, the knee for an elbow and the foot for a hand. The points of distinction are as follows:

(1)

BREECH.

The ischial tuberosities and the sacrum can be made out.

The aperture through which the finger is passed is recognised to be the anus, because of the grip of the sphincter, pure meconium staining the finger and the absence of alveolar ridges and the tongue.

The external genitalia can be recognised particularly in the male.

The groove of the groin is reached on passing the finger high up.

FACE.

The hoof-like chin and malar eminences and the supra-orbital ridges are to be particularly noted.

The aperture is made out as the mouth because of the sucking movements, the presence of alveolar ridges and the tongue.

No suggestion of external genitalia in face presentation.

The ear can be palpated on passing the finger high up.

(2)

KNEE.

Broader surface.

The patella can be made out

Two tuberosities with a depression between.

ELBOW

Narrower surface.

No suggestion of any patella.

Two condyles with the sharp olecranon between.

(3)

FOOT.

The toes are more or less on the same level.

The great toe is in the same plane as the other toes.

Prominence of the heel felt distinctly.

The foot is at right angles to the leg

HAND.

The fingers are at varying levels.

The thumb can be apposed and opposed to the other fingers.

No prominence to be felt.

The hand can be placed in the same plane as the forearm.

In cases of extended breech the diagnosis is facilitated by the fact:—

- (1) That the ischial tuberosities, the sacrum and the external genitals can be made out.
- (2) That the thighs are flexed on the abdomen.
- (3) That neither a knee nor a foot can be made out on vaginal examination.
- (4) That the breech is almost filling the pelvic brim or cavity.

Prognosis.—Mother. The maternal mortality and morbidity are slightly higher than in vertex presentations for the following reasons:—

- (1) The very occurrence of a breech presentation suggests the possibility of some causal abnormality.

- (2) Labour is prolonged, internal examinations may be more frequent and the chances of infection are thereby increased.
- (3) Premature rupture of the membranes and failure of the cervix to be completely dilated by the breech may increase the risk of laceration in the course of delivery.
- (4) The possibilities of complications, such as extended breech, which interferes with the usual mechanism of breech presentation.
- (5) The frequency with which assistance is needed to complete the delivery.
- (6) The necessity for rapid delivery of the head in some cases causes sudden dilatation and stretching of the vagina and the perineum resulting in a greater degree of trauma.

Child. The relatively higher foetal mortality is one of the chief factors responsible for the uneasiness and even dread with which cases of breech presentation are approached. In uncomplicated cases, provided the correct technique is adopted, we do not think that breech presentations should cause a higher foetal mortality than vertex presentations.

The causes of increased foetal mortality and morbidity in breech presentations are :—

(1) *Asphyxia.* This is the commonest cause and may be brought about in various ways :—

- (a) Early rupture of the membranes with escape of liquor amnii resulting in a dry labour.
- (b) Prolapse and compression of the cord.
- (c) The escape of the breech through a partially dilated cervix which grips the neck of the child and prevents the delivery of the after-coming head.
- (d) The impact of cold air on the body as it is being delivered may cause premature attempts at respiration while the head is still in the pelvis resulting in the sucking in of liquor amnii and mucus.
- (e) Pressure of the after-coming head on the cord.
- (f) Intracranial stress from sudden delivery of the after-coming head resulting in hæmorrhage.

(2) *Injuries to the Child.* During the course of delivery several injuries may be inflicted on the child, some of which may prove fatal. These are :—

- (a) During delivery of the breech. Fracture of the femur, laceration of the soft parts of the thigh or the abdominal

wall; injury to the femoral vessels and sometimes perforation of the abdominal wall.

(b) During delivery of the shoulders. Fracture of the humerus or clavicle; injury to the brachial plexus with resulting paralysis.

(c) During delivery of the after-coming head. Dislocation or fracture of the lower jaw, injury to the floor of the mouth, injury to the sternomastoid muscle with bruising and the formation of a hæmatoma; injury to spine and spinal cord; intracranial injuries or fracture of the cranial bones. The most frequent cause of foetal death is intracranial injury, particularly tears of the falx cerebri and of the tentorium cerebelli. Such intracranial injuries are much more frequent with premature children.

(3) *Premature Separation of the Placenta.* Occasionally this complication results from fundal pressure or from uterine contractions subsequent to the passage of the head into the lower uterine segment, but before the child is fully delivered.

This formidable list of adverse factors to be considered in estimating both the maternal and foetal prognoses will naturally give the impression that a breech presentation is undoubtedly a grave one to deal with. Many of these adverse factors can, however, be avoided by suitable care and properly applied manipulative methods.

Management.—Before Labour. When a case has been diagnosed as a breech presentation, every endeavour should be made to ascertain the cause, since the line of treatment to be adopted depends largely on this. If due to a contracted pelvis, the variety and degree of contraction should be determined. In minor degrees of flat pelvis a breech presentation may not be unfavourable, and in such cases delivery as a breech may be undertaken at term. In other varieties of contracted pelvis other lines of management will have to be adopted, depending upon the type and degree of contraction.

Where no contraction of the pelvis exists, should a breech presentation be allowed to continue as such?

The prevalent view is that it is always desirable to try and convert a breech into a vertex presentation, as it offers a better prognosis both for the mother and the child. The question, however, has to be considered with reference to the parity of the mother. In a primipara, it is certainly of advantage to convert a breech presentation into a vertex, as the dilatation of the vagina and perineum is not so easy and the difficulties of delivery are

increased. In a multipara, with a normal pelvis and with a history of uncomplicated previous deliveries of living children at term, we are not convinced that it is necessary in every case to convert the breech into a vertex. We have frequently noticed that the breech tends to correct itself into a vertex presentation in the last few weeks of pregnancy, and this is safer than injudicious attempts at external manipulations. It is advisable, therefore, to wait till the thirty-sixth week of pregnancy before attempting external version. After this date the increasing size of the child makes the manipulation more difficult. The risks incidental to the conversion of a case of extended breech should also be borne in mind, and in some cases vigorous attempts at external version have been followed by premature separation of the placenta and even laceration of the uterine wall. The cord of the foetus also may become twisted round the trunk or the limbs, and thus the child may be asphyxiated. Occasionally the version may only partially succeed resulting in a less favourable lie or presentation, viz:—an oblique or transverse lie. We have mentioned these facts to show that the general impression that an external version is easy and will, as a matter of course, succeed in converting a breech into a vertex presentation, is not borne out by actual experience and that there are certain dangers and difficulties associated with this manipulation. In particular, external version should, as far as possible, be done without an anaesthetic, as this helps in judging the amount of force that is used. At the same time, it should not be thought that external version is not of any value or that it has no place in the management of breech presentations before labour or even early in labour. We prefer to leave a breech presentation as a breech.

- (1) In multiparæ with a normal pelvis and history of previous natural deliveries of living children at term.
- (2) Hydrocephalus.
- (3) Cases of placenta prævia.
- (4) Minor degrees of flat pelvis.

During Labour. We shall now consider the management of a breech presentation in an uncomplicated case, that is one where there are no abnormalities, such as contracted pelvis, etc.

First Stage. The patient should not be allowed to walk about but should lie down throughout the first stage and avoid all bearing-down efforts. It is desirable that the bag of membranes should remain intact till full dilatation of the cervix occurs. When the membranes rupture a vaginal examination should be made with care to note the dilatation of the cervix, to observe if the cord is prolapsed and find out whether it is a case of extended breech.

Second Stage. Once the cervix is fully dilated the rule to be observed in the delivery of an uncomplicated breech is to leave it as far as possible to nature. Fundal pressure can be judiciously used during uterine contractions to help the delivery. Traction from below is better avoided altogether. The obstetricians's duty should be one of watchful expectancy, and nowhere is there greater need than here to desist from the habit of meddling interference. The temptation to pull upon some prolapsed part of the foetus, such as a lower limb is very great, but it will lead to a string of complications at every stage in the delivery of the child.

Another point of importance to remember is that it is a fatal mistake to try and deliver a breech through an imperfectly dilated cervix. Although the soft trunk may easily be compressed and delivered, the delivery of the after-coming head will be attended with great difficulty and the neck may be gripped by the partially dilated cervix.

In the delivery of all breech cases, no matter with what ease the child may be born, it is occasionally asphyxiated and accordingly everything should be kept ready to treat the condition of asphyxia neonatorum.

Delivery of the breech should be undertaken after rupture of the membranes following full dilatation of the os when the breech begins to distend the perineum. The dorsal position for the mother is the ideal. Occasionally the feet may be caught at the vaginal outlet, in which case they are gently released by the fingers. As soon as the breech is delivered and the body born up to the umbilicus it should be covered by a warm towel to prevent the impact of cold air which might stimulate premature attempts at respiration. From this point onwards the delivery of the breech should be aided only by fundal pressure. The operator supports the breech and when the child is born up to the umbilicus a loop of the cord is brought down and placed to one side so that it lies in the lacuna in front of the ala of the sacrum. This is done for three reasons:—

- (1) To prevent the cord from being compressed in the subsequent course of delivery.
- (2) To prevent the cord from being caught at the brim and being snapped.
- (3) To feel the pulsations of the cord and so watch the condition of the foetus from time to time.

The next pain will probably drive the shoulders with the arms in a flexed position by the side of the body through the vaginal outlet. After the shoulders are born the head generally slips out

with the next pain. If, however, the head is not delivered it may be because it is lying in the lower uterine segment where uterine contractions have no effect. It may therefore be necessary to assist the delivery of the head. First try fundal pressure, which



FIG. 115.—Method of delivery of the breech.
Note the method of holding the breech in traction.

in the majority of cases will be found sufficient to help the head out. If this does not succeed, one of the several manipulative methods for delivery of the after-coming head should be adopted (*vide infra*) along with efficient fundal pressure given by an

assistant. We hold that fundal pressure is of the utmost importance, because it is by this means that the head is maintained in an attitude of flexion, with the suboccipito-bregmatic diameter as the diameter of engagement.

As soon as the child is delivered, care should be taken to see that it is breathing; otherwise the cord should be clamped and cut and the child treated for asphyxia neonatorum.

Complications. The course of events may not be as smooth as described above. Various difficulties may arise in the course of delivery of a breech presentation, and such difficulties may be due to several factors. The chief of these are:—

- (1) Premature rupture of membranes with imperfect dilatation of the cervix.
- (2) Prolapse of the cord.
- (3) Extended breech.
- (4) Impacted breech.
- (5) Extended arms.
- (6) Nuchal position of the arms.
- (7) Difficulties in the delivery of the after-coming head.

These complications are dealt with *seriatim*.

1. *Premature Rupture of Membranes.* It has already been emphasised that complete dilatation of the cervical canal is one of the most important conditions necessary for the successful delivery of a breech. Attempt at delivery through an imperfectly dilated cervix spells disaster. The dangers are twofold. So far as the mother is concerned it means the risk of serious lacerations which may sometimes extend into the lower uterine segment and involve the uterine vessels or open into the peritoneal cavity. Occasionally the soft breech may come through a partially dilated cervix, especially if the child is premature, while the neck of the foetus is gripped by the cervix and difficulty is experienced in the delivery of the after-coming head leading to severe degree of asphyxia. For these reasons, therefore, it is desirable to prevent early rupture of the membranes. The patient should be in bed in the first stage of labour.

Should the membranes, however, rupture prematurely, time must be given for the cervix to dilate fully. A chloral and bromide draught or any mild hypnotic is of service at this juncture, as it relieves the woman of teasing ineffective pains and gives her the much-needed rest. In the majority of cases the cervix will, with the aid of efficient uterine contractions, dilate in course of time.

In cases where the cervix is not dilating and the uterine contractions are ineffective, the use of a hydrostatic dilator like a

Champetier de Ribe's bag is indicated. This bag is applied through the cervical canal, beyond the internal os and left in position for some hours. The conditions under which it can be used, the method of application etc., are described in a later chapter.

Should, however, any necessity arise for immediate delivery in the interests of the child or the mother, complete dilatation of the cervix should be effected before the delivery is attempted. Such dilatation of the cervix may be effected by one of the following methods :—

- (a) *Manual Dilatation of the Cervix.* This is the method adopted in the large majority of cases where the cervix is soft and dilatable. The gloved hand is introduced with the usual antiseptic precautions inside the vagina and the cervical canal is gradually stretched by separating the fingers till the canal is fully dilated.
- (b) *Multiple Incisions of the Cervix.* This method is adopted when rapid delivery is indicated in the interests of the foetus, in cases where the cervical canal is effaced but the external os is only partially dilated. The details of this operation are dealt with in a later chapter.

We do not advocate rapid dilatation of the cervix by the use of branched metallic dilators. These instruments are obsolete now and they had better be discarded from the obstetric armamentarium.

2. *Prolapse of the Cord.* This is an occasional complication in the course of delivery of the breech. It is due to the fact that the breech does not fill the pelvic brim and thus allows of a communication between the fore- and after-waters; the force with which the liquor amnii may escape when the membranes rupture owing to the tenseness of the bag may sometimes wash the cord in front of the presenting part. A vaginal examination should be made to note if the cord is pulsating and also the degree of dilatation of the cervix. If the cord is pulsating and the cervix is effaced and dilated, immediate delivery is indicated. In other cases, the cord may be replaced and kept to one side to avoid compression and the foetal heart carefully watched. If the cord is pulseless and cold, delivery may be left to natural powers.

3. *Extended Breech.* This term is applied to the condition where the breech presents with the thighs flexed on the abdominal wall and the legs extended at the knee. The lower extremities in this attitude act as splints and prevent the movement of lateral flexion from taking place, so causing delay in delivery.

In extended breech the presenting part may not engage itself at the brim of the pelvis if there is relative disproportion. Such disproportion may be due either to contractions of the pelvis or anomalies of the foetus, such as foetal ascites, tumours of the lower pole of the foetus, etc., or to excessive size of the foetus.

If there be no disproportion and no abnormality of the foetus, and the extended breech is arrested in its passage through the birth canal, it is best to bring down one foot so that the later complication, impacted breech, may not occur. For this purpose the gloved hand is introduced into the birth canal, with the patient under an anæsthetic, the fingers are then guided along the posterior aspect of the thigh to the knee and gentle pressure exerted in the popliteal space. This will cause the leg to flex at the knee when the index finger is passed along the shin till it reaches the foot and then completes the flexion, so that the foot can be grasped and brought down to the vulva.



FIG. 116.—Bringing down a foot in extended breech.

Should there be no immediate necessity for delivery the case is left to nature.

If labour is progressing favourably and there are no signs of distress, either foetal or maternal, the extended breech may be delivered spontaneously. But as the extended breech is likely to become impacted it is necessary to be ready to bring down a foot at the first sign of this complication appearing.

4. *Impacted Breech.* This term is applied to the condition where the extended breech has descended into the pelvic cavity and become jammed, further progress being impossible. In such

cases the woman presents all the signs and symptoms of prolonged labour and the uterus itself may be tonically contracted.

There are three methods of treatment for this condition:—

(a) When a case of impacted breech is met with it is advisable to put the patient under an anæsthetic and find out if the breech is definitely impacted. Occasionally, with the patient under an anæsthetic, it is possible gently to push up the breech, provided the uterus will permit of this manipulation, and then to pass the fingers along the thighs, press at the posterior aspect of the knee in the popliteal space and bring down a foot.

(b) If, however, this manipulation is not possible, cases of impacted breech may be delivered, as such, by *traction on the whole breech* carried out by any of the following methods:—

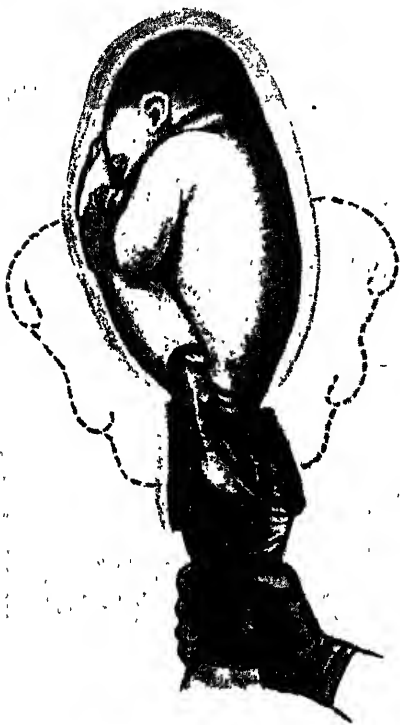


FIG. 117.—Finger traction in impacted breech.

(1) By traction applied with the fingers passed into one or both groins.

(2) By traction with a fillet of gauze.

(3) By traction with a blunt hook.

(1) *By Traction with the Fingers.* With the patient under an anæsthetic and after taking the usual antiseptic precautions, pass the index finger of the gloved hand into one groin, and after steadying it apply traction by catching hold of the wrist of that hand by the other hand, and pulling directly downwards and backwards. The finger may slip or the traction applied may not be sufficient to bring the breech down. In such cases the index fingers of both hands may be passed, one into each groin,

and traction applied by both fingers simultaneously.

(2) *By a Fillet of Gauze.* A sterile strip of gauze is passed round the groin by means of a male catheter, to which it is tied, and traction is applied to the groin by pulling on the gauze. Care must be taken to see that the traction is exactly along the line of the groin and not towards the thigh, as under such circumstances the pressure may easily produce fracture of the femur.

(3) *By the Use of the Blunt Hook.* This is a hook made of metal, semicircular in shape and with a blunt end. With the woman under anæsthesia the sterilised hook is passed along two fingers introduced into the vagina with the blunt knob of the hook directed posteriorly, and when it has come to the level of the groin the hook is gradually turned at right angles and slipped into the groin, so that the knob of the hook is still directed posteriorly. The object of this is that if the hook by any chance slips, the knob will impinge on the posterior wall of the vagina where no damage is likely to occur; whereas if the knob were directed anteriorly and the hook slipped, the knob would hitch against the anterior vaginal wall and might easily lacerate the anterior vaginal wall and

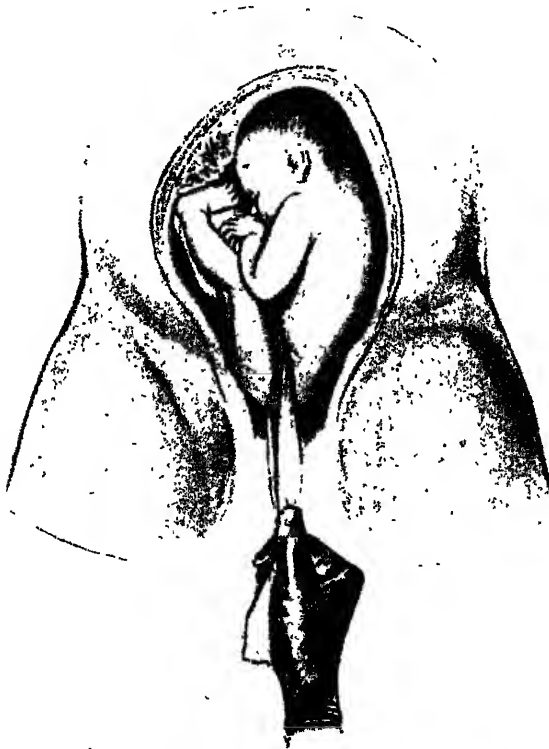


FIG. 118.—Fillet traction in impacted breech.

even the bladder. Judicious care is necessary in applying traction with the blunt hook; so much so, some obstetricians would confine its use to cases where the foetus is already dead. We, however, believe that with care it is possible to deliver a living child without damage.

The dangers in the use of the blunt hook are fracture of the femur, laceration of the soft parts, bruising and occasionally rupture of the femoral vessels.

When by one of these methods the breech is brought down beyond the seat of impaction it will be found that its further progress is usually fairly easy, except that the perineum will have to stretch very much more than in a case of incomplete breech, and so an episiotomy may be indicated.

(c) A method which has been advocated by some is the use of the obstetric forceps in a case of impacted breech. The forceps is not meant for a breech which does not permit of a proper grip. We have not met with one single case where its application was found necessary.

5. *Extended Arms.* The next difficulty that may be met with during delivery is the condition known as extended arms. One or both arms may be extended. If delivery of the breech has been spontaneous, traction avoided and fundal pressure applied, cases of extended arms will be few. Where it is necessary to deliver a breech by traction, extended arms are much more frequently encountered.

After delivery of the breech the obstetrician should allow the trunk to descend, pull down a loop of the cord and keep it to one side, so as to watch its pulsations and to prevent it from being nipped. If the next few pains do not bring the arms into view the presumption is that they are extended. In such cases, traction must be applied to the body of the foetus till one or other of the axillary folds is visible outside the vaginal outlet. It is a mistake to pass the hand high up into the cervical canal with a view to bring down the extended arm. In such cases, a portion of the trunk is still in the pelvic cavity, and the arms are generally high up so that considerable difficulty may be experienced in reaching them. The chances are that in trying to dislodge the arms and bring them down a greater amount of force may be applied and a fracture of the humerus or clavicle may result. We have found it extremely useful to continue applying steady traction till one or other of the axillary folds is seen well outside the vaginal outlet, and only then to pass the index finger of the hand along the back on to the shoulder of the foetus, and work gradually forwards over the anterior aspect of the upper arm till we get to the elbow, whereupon flexion occurs and the arm is gently swept downwards along the side of the body of the foetus.

In some cases this manipulation is facilitated by carrying the body of the child forwards towards the mother's abdomen so as to release the posterior arm, and conversely, by carrying the body

towards the sacrum to release the anterior arm. It is not of much significance which arm is released first, as in the majority of cases this will depend upon the space available in the anterior or posterior segment of the pelvic cavity. Occasionally it is desirable to rotate the body, grasping it high up near the shoulders and with a view to bring the anterior arm posterior, where in the hollow of the sacrum a greater amount of space is generally available.

6. *Dorsal Displacement of the Arm or Nuchal Position.* In this condition the arm is extended at the axilla and semi-flexed at the elbow so that the forearm rests behind the occiput. Under such circumstances greater difficulty is experienced in releasing the extended arm. Sometimes one arm may be in the nuchal position; occasionally both arms may be in this position. In either case the first manipulation consists in rotating the body of the foetus towards the side to which nuchally placed hand points. This releases the arm from the nuchal position, but it will still be extended at the shoulder, and this condition must be corrected in the manner described above. Where both arms are in nuchal position the manipulation will have to be repeated in a reverse direction to release the other arm.

7. *Difficulties in the Delivery of the After-coming Head.* Delay in delivery of the after-coming head may be due to:—defective expulsive forces, extension of the head, imperfect dilatation of the cervical canal, occipito-posterior positions of the head.

When the uterus contracts upon the after-coming head, the contractions are in many cases sufficiently strong to expel the head through the birth canal. Occasionally, however, this may not suffice and then the head lies in the lower uterine segment or vaginal cavity. In such a position the contractions of the upper uterine segment have no effect upon the further progress of the head and so delay in the birth of the after-coming head results.

It must be realised that at this stage of delivery delay is dangerous, for the cord is being continually compressed and thus the foetal circulation interfered with. Besides this, premature attempts at respiration may be made by the foetus due to the impact of cold air on its body. The after-coming head has therefore to be delivered promptly within five to eight minutes after the delivery of the trunk.

One of the following methods of delivery may be adopted in such cases, provided the cervix is fully dilated.

(a) *Suprapubic Pressure.* Where the head is in a flexed condition and no disproportion is present, suprapubic pressure may suffice to expel it. Suprapubic pressure to be effective must be

given with the woman in the dorsal position and the thighs semi-flexed. The operator applies the palmar aspect of his hand to the foetal head through the abdominal wall above the symphysis pubis and presses directly in the axis of the brim of the pelvis.

If this simple manipulation is not sufficient to deliver the head there are several manœuvres which may be tried; the most important of these are:—

(b) *Prague Method*. To apply this method the patient lies on her back; the right hand of the operator grasps the legs of the child, while the index and middle fingers of the left hand are placed one on either side of the child's neck and the shoulders thus grasped.

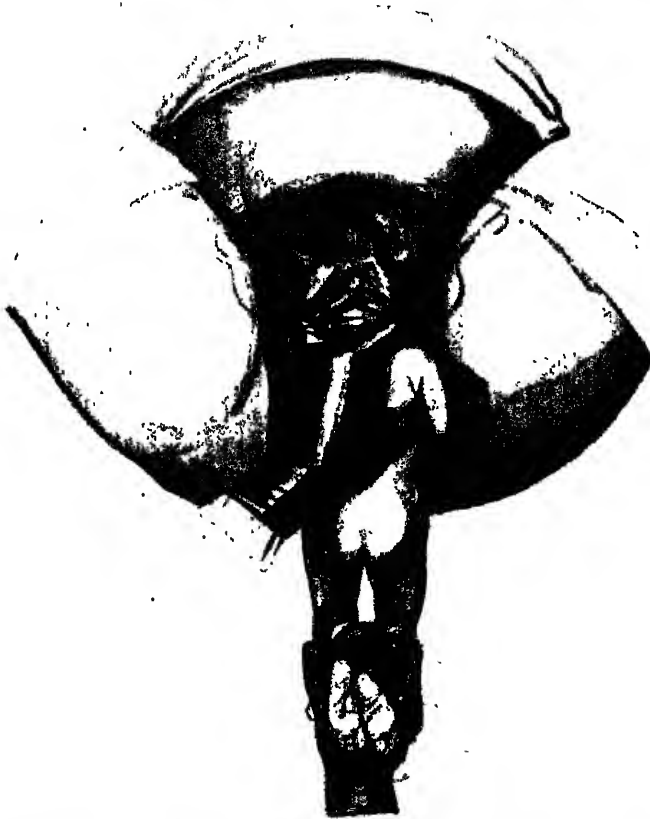


FIG. 119.—The Prague seizure: method of delivery of the after-coming head.

An assistant now gives effective suprapubic pressure while the body of the foetus is carried forward towards the mother's abdomen, the occiput being kept pressed against the symphysis pubis as the chin, face, brow and vertex appear in turn at the vulva. This method may be applied in cases where the after-coming head is arrested in the pelvic cavity.

(c) *Martin's Method*. In this manœuvre the body of the child rides astride the forearm of the operator, while one finger of that hand is passed through the vaginal canal into the mouth of the child and light pressure applied upon the lower jaw to promote flexion of the head; with the other hand, or preferably by the help of an assistant, suprapubic pressure is applied and the head is thus expressed. The finger in the mouth does not act as a tractor but merely keeps the head in an attitude of flexion, so that



FIG. 120.—Smellie-Veit's manœuvre: method of delivery of the after-coming head.

when suprapubic pressure is applied the smallest diameter of head may pass through the pelvic canal.

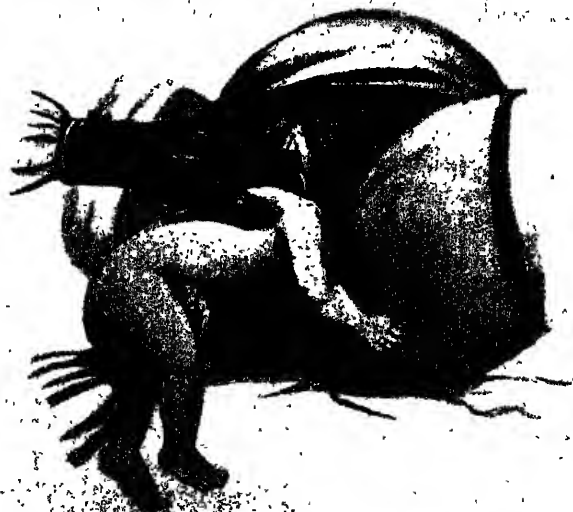


FIG. 121.—Delivery of the after-coming head: Smellie-Veit's.

(d) *Mauriceau-Veit or Smellie's Method.* Here one arm is passed in much the same manner as in Martin's method, a finger being introduced into the mouth of the child which is supported on the forearm. With the other hand the shoulders of the child are grasped as in the Prague seizure. An assistant makes suprapubic pressure, while the operator delivers the child by gentle traction downwards and forwards.

We have for long adopted a slightly modified form of this manœuvre, wherein we combine the Prague and Martin's methods. The child rides astride the forearm and one finger is passed as far as possible into the mouth; the other hand grasps the two legs of the child and carries them forward over the mother's abdomen, while an assistant applies effective suprapubic pressure. Here the finger in the mouth keeps the head in an attitude of flexion. The fingers which grasp the legs carry the body forwards and give the necessary traction, while suprapubic pressure effectively given aids the expulsion of the head, and thus delivery is completed in the shortest possible time. We have found this extremely efficacious



FIG. 122.—Delivery of the after-coming head when the occiput is posterior.

and seldom have we had cause to regret having applied this manipulation in cases where no definite disproportion existed. In primipara, in particular, the delivery is rendered easier by an episiotomy.

Several other methods have been described in the literature; the principle underlying these is the same—to promote flexion of the head with a view to making the smallest diameter pass through the pelvic cavity and to supply the necessary force by traction and suprapubic pressure.

(e) *Forceps to the After-coming Head.* In the majority of cases one or other of the manoeuvres described above will succeed in the delivery of the head; but in a few the delivery is not so easy and the use of the forceps may be necessary. Sufficient emphasis cannot be laid on the fact that undue traction or misdirected attempts at traction on the trunk of the child may lead to fracture and dislocation of the upper part of the spinal column, and that excessive and too vigorous suprapubic pressure may result in intracranial hæmorrhage. To prevent such damages it is sometimes necessary to apply forceps to the after-coming head, after moderate attempts at traction and fundal pressure have failed. In fact some obstetricians always have forceps ready when dealing with a breech presentation and use it if there is the slightest difficulty in delivery of the head.

To apply the forceps an assistant carries the body of the child forward towards the mother's abdomen and the operator introduces the blades, one on either side of the head, and then applies steady traction. We ourselves prefer to apply forceps from below the child's body, but in cases where the occiput is posterior it may be advantageous to apply the forceps from above the child's body. These positions refer to delivery in the dorsal position.

(f) *Perforation.* If forceps fail nothing remains but to perforate through the sub-occiput or roof of the mouth and deliver the after-coming head. We do not consider any other method of treatment justifiable, as by this time the condition of the fœtus is such that only the mother's safety counts. Details of the operation are given in a later chapter.

It has been suggested that in some cases of flat pelvis or moderate degrees of outlet contraction, postural methods of treatment may be combined with the methods of extraction already referred to—the woman being kept in Walcher's position in a case of flat pelvis and in the exaggerated lithotomy position in cases of contractions of the outlet. We refer to this method of treatment as an aid to delivery in a later chapter.

A difficulty that may sometimes be experienced in the delivery of the after-coming head is its extraction in cases where the occiput is directed posteriorly. Such a complication should be extremely rare, particularly if the accoucheur has been in attendance from the beginning. In all cases where the back is posterior, if spontaneous anterior rotation does not take place during delivery of the legs, a very slight rotation of the foetal pelvis to carry the sacrum anteriorly is sufficient to ensure the occiput being in the anterior segment. It may, however, happen that the trunk is born

before assistance is available, or the simple manœuvre of rotation referred to may not have been performed, and in such cases a posterior position of the head results. Even under such circumstances the head may be grasped in the ordinary way employed for the delivery of the after-coming head, pushed up a little, and the occiput rotated forwards simultaneously with rotation of the trunk. If rotation is impossible or does not succeed because the head is too firmly fixed in the pelvis or because the chin is caught by the symphysis pubis, delivery of the head may be favoured by grasping the shoulders with the two fingers of the other hand. The child is first pulled backwards so that the forehead is fixed against the posterior surface of the symphysis pubis and then the trunk is carried upwards on to the abdomen of the mother. If there still be difficulty in the delivery, forceps may be applied. Deep tears of the perineum are inevitable, and it is preferable to perform a prophylactic episiotomy in such cases. Where delivery cannot be effected craniotomy, as has been described above, is the only method of delivery now available.

Fœtal Injuries in Breech Deliveries. It will be seen from what has been stated above regarding the difficulties in the delivery of a breech presentation that the fœtus is liable to several injuries during the course of delivery. They are:—

- (1) Fracture of the femur.
- (2) Lacerations of the femoral vessels.
- (3) Bruising of the abdominal walls and occasionally of the abdominal viscera.
- (4) Fracture of the humerus.
- (5) Fracture dislocation of the spinal column.
- (6) Bruising and rupture of the sternomastoid muscles.
- (7) Fracture of the lower jaw.
- (8) Injuries to the mouth and pharynx.
- (9) Trauma of nerve trunks leading to paralysis.
- (10) Contusions, spoon-shaped depressed fractures of the skull, intracranial hæmorrhages, tears of the tentorium cerebelli or falx cerebri.

The extent of the injuries will depend upon difficulties arising in the course of delivery and the particular method of delivery adopted to overcome them. Ordinarily where no disproportion is present and no complications are met with, fœtal injuries are rare. If the case is properly conducted.

CHAPTER XXIX

TRANSVERSE OF OBLIQUE LIE

WE have so far described presentations where the foetal lie was longitudinal; that is the long axis of the foetal ovoid corresponded to the longitudinal axis of the uterine ovoid. In a transverse or an oblique lie, the foetus lies generally with the cephalic pole in one or other of the iliac fossæ and the breech at the opposite end of an oblique diameter of the uterine ovoid. A true transverse lie, as such, does not occur in the majority of instances, as the natural tendency is for the heavier part, the cephalic pole, to slip towards one of the iliac fossæ, while the breech passes in the opposite direction resulting in an oblique lie.

Incidence. Transverse or oblique lies are not infrequent. At the Women and Children's Hospital, Madras, in 20,420 consecutive cases there were 127 cases of oblique lie, giving a proportion of 1 in 160. It is more frequent in multiparæ than in primiparæ and occurs oftener in a premature labour than at term.

Ætiology. The causes of transverse lie are generally those which favour any malpresentation. They may be classified under maternal and foetal causes.

Maternal. (1) Contracted pelvis. This condition gives rise to several abnormal presentations and not infrequently the head, failing to engage at the pelvic brim, is displaced towards one or other of the iliac fossæ. The occurrence of an oblique lie is thus favoured. The possibility of this causative factor should be investigated when one meets with cases of oblique or transverse lie in primiparæ.

(2) Placenta prævia.

(3) Multiparity if associated with an unduly lax uterine or abdominal wall.

(4) Obliquity of the uterus.

(5) Hydramnios.

(6) Tumours in the region of the lower uterine segment which prevent the engagement of the head at the pelvic brim, such as fibroids, ovarian cysts and other new growths.

(7) Anomalies of the uterus, such as a bicornuate or a septate uterus.

Foetal. Twin pregnancy, monsters, prematurity and maceration of the foetus.

It will be seen that most of the causes of an oblique lie are those which do not permit of the foetal head engaging properly at the pelvic brim.

Positions. When the foetus presents transversely there are four positions that it can occupy, corresponding to the four positions in a vertex, face or breech presentation. The positions are:—

Transverse.	Vertex.	Face.	Breech.
L.D.A. or L.A.A.	L.O.A.	R.M.P.	L.S.A.
R.D.A. or R.A.A.	R.O.A.	L.M.P.	R.S.A.
R.D.P. or R.A.P.	R.O.P.	L.M.A.	R.S.P.
L.D.P. or L.A.P.	L.O.P.	R.M.A.	L.S.P.

Thus in an oblique lie the head may be either in the left or right iliac fossa, with the back in front or behind. When the head is in the left iliac fossa, with the back in front, the position is left dorso-anterior or L.D.A., the dorsum being taken as the denominator.

Another mode of nomenclature is to choose the acromion process as the denominator, in which case this position would be known as left acromio-anterior or L.A.A.

Diagnosis. The diagnosis of an oblique lie should not present much difficulty if the case is seen antenatally or early in labour.

Inspection reveals that the uterus is stretched transversely and that the fundus is at a lower level than the period of pregnancy would warrant.

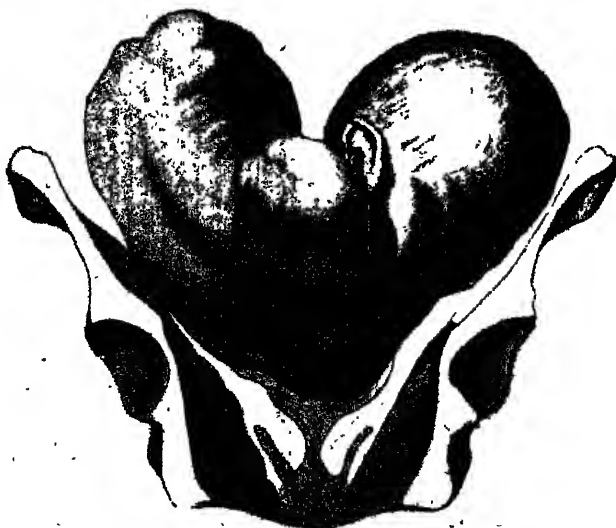


FIG. 123.—Left acromio-anterior.

Abdominal palpation enables one to recognise that the head is in one or other of the iliac fossae and the breech on the opposite

side and at a higher level. In some cases the breech may be in one or other of the iliac fossæ and the head in the opposite side at the fundus. Such cases tend to correct themselves spontaneously into a breech presentation when labour begins.

The foetal heart is generally heard on a level with the umbilicus, while in vertex presentations it is heard well below the umbilicus and in breech well above the umbilicus.

Vaginal Examination. When the patient is in labour a vaginal examination is of great assistance. Early in labour the signs of abnormal presentation will manifest themselves, such as cone-shaped bag of membranes, imperfect dilatation of the cervix, and after rupture of the membranes the presenting part being high up the cervical lips hang down loosely. The special signs by which one can recognise an oblique lie by vaginal examination are the palpation of certain bony landmarks and soft parts. On a careful examination *per vaginam* one may feel the hand, elbow or the shoulder, and, if the fingers are passed up further the side of the chest may be palpable.

The points of difference between a hand and a foot and between an elbow and a knee have already been discussed. The shoulder can be recognised by palpating the acromion process, the scapula,



FIG. 124.—Oblique presentation with one hand prolapsed: method of recognising the side to which the hand belongs by shaking hands.

the clavicle and the axilla. On palpating further the chest of the foetus can be made out by noting the ribs which run parallel to

each other. Occasionally, when the presenting part is up, it may be necessary to put the patient under æsthesia to make a thorough examination to avoid any possibility of mistake. In some cases a foetal hand may be prolapsed, but this does not necessarily follow that if hand is palpated the case is one of oblique lie, as in compound presentation, the hands may present together. Careful vaginal examination will obviate such mistakes. When the hand is prolapsed the side to which it belongs can be determined by feeling the hands with it.

Course of Labour. Supposing a woman who goes into labour, what may happen to her? It is not realised that an oblique lie offers insuperable difficulties to the delivery of the foetus. In fact, it may be stated that in a woman with a normal pelvis and a normally developed foetus at term, protracted labour, spontaneous termination of labour is impossible. There are a few ways in which an oblique lie may deliver itself; but the most exceptional that they must never be counted upon. The ways in which an oblique lie may terminate spontaneously are:

- (a) Spontaneous rectification or version.
- (b) Spontaneous evolution.
- (c) Birth *corpore conduplicato*.

The term spontaneous rectification is applied when the correction results in a cephalic presentation. When a breech presentation results the term spontaneous evolution is used.

In *spontaneous rectification* or *version* the foetus becomes either a vertex or a breech presentation. In cases, when the uterus begins to contract at the onset of labour, the contractions may force the breech down toward the pelvic brim. The presentation is thus converted into a cephalic presentation. Rectification may occur when the head is in the iliac fossa. Uterine contractions may be so directed as to push the head toward the pelvic brim and thus allow it to engage. Rectification or version may therefore occur, due to the uterus correcting minor degrees of oblique presentation. A possibility is more frequent in multiparæ than in primiparæ.

Spontaneous Evolution. In such cases the oblique lie persists. Very often the hand may also be prolapsed, but afterwards it becomes prolapsed the trunk and breech are forced down so that during delivery the shoulder appears first, followed by the thorax, the buttocks, the opposite shoulder

head. Such a termination generally occurs with unusually small children such as twins, or in premature births.

Birth "Corpore Conduplicato." This is extremely rare. Unlike spontaneous evolution the foetal head and body enter the pelvis together and the child is born doubled up, the head and feet simultaneously coming together last. Such a termination is only possible when the child is macerated or very premature.

The above spontaneous terminations of shoulder presentation are exceptional, and in the great majority of cases the natural powers fail completely to expel the foetus. Under such circumstances, when the woman goes into labour, the pains will come on at more or less long intervals during the first stage of labour. After a certain time the membranes rupture, stronger uterine contractions develop and a hand is probably prolapsed. With each pain the hand comes down more and more into the vaginal cavity and may present at the vulva and even the shoulder may be seen. The



FIG. 125.—Shoulder presentation. Birth *corpore conduplicato*.

hand becomes swollen and oedematous and bluish, and more powerful contractions of the uterus develop. With each successive contraction the foetus is forced down out of the upper uterine

segment, but cannot escape, with the result that the lower uterine segment becomes more and more dilated to accommodate it. The upper segment is contracting and retracting while the lower segment is dilating, and the result of this is that the walls of the upper uterine segment steadily become thicker and thicker, while the walls of the lower segment become more and more thinned out and stretched. The demarcation between the upper and lower uterine segments is marked by the characteristic Bandl's ring or retraction ring, which gradually rises higher and higher, sometimes reaching as high as the umbilicus. The height at which this ring is noted indicates the extent to which the stretching of the lower uterine segment has taken place and therefore the degree of thinning of its wall. Finally, a stage is reached when the lower uterine segment can stretch no more, and then one of two events occurs; the uterus either ruptures or secondary uterine inertia develops.

When rupture takes place the woman feels a momentary relief as uterine contractions cease; but the result of the rupture is that



FIG. 126.—Neglected shoulder presentation. Note the retraction ring

the foetus and placenta may escape partially or wholly into the abdominal cavity. The woman will show signs of shock and collapse due to the rupture of the organ and lacerations of its main blood vessels. In course of time, if assistance is not available, a fatal termination is inevitable.

In cases where secondary uterine inertia occurs, the foetus may sometimes survive and be born alive, if suitable treatment is available. In other cases death of the foetus is inevitable and the patient herself dies of exhaustion or later of septic complications.

Prognosis. In cases which are left to themselves the prognosis is grave, both to mother and child. When assistance is available the outlook depends on several factors.

- (1) The stage of pregnancy or labour when the condition is recognised.
- (2) The time that elapses before the correction of the malpresentation.
- (3) The condition of the uterus and cervix, and particularly the condition of the lower uterine segment and the height of the retraction ring.
- (4) The time that has elapsed since the membranes have ruptured and the quantity of liquor amnii that still remains in the uterus.
- (5) Prolapse of the cord as a complication.
- (6) Other ætiological factors, such as contracted pelvis, tumours of the lower uterine segment or placenta prævia.

In uncomplicated cases of oblique lie or shoulder presentation, if properly recognised and suitably treated, the prognosis need not be unfavourable to the mother or the child. Owing to risks of interference, however, it must be definitely stated that an oblique lie increases both the foetal and maternal risks.

Management. When a case is diagnosed as an oblique lie it is obvious that it cannot be delivered spontaneously and that interference is definitely indicated. Any delay is dangerous, and the sooner the malpresentation is corrected by external, combined or internal version, the better the prognosis. It must be converted into a more favourable presentation, which may be a cephalic or occasionally a podalic presentation. The conversion of a oblique lie into a breech presentation, in the absence of any particular contraindication is, in our opinion, a wiser course, as with the slight dislodgement of the breech, even if an oblique lie should result, it is easier in the subsequent stages of delivery to get at a foot and

complete the conversion into a breech presentation. In cases, however, where an oblique lie has been converted into a vertex presentation and the head has slipped again into the iliac fossa, the arm prolapses and the difficulties in the management are as great as before conversion.

When an oblique lie is diagnosed, first find out the cause of it; and if it is due to a contracted pelvis the treatment will depend upon the degree and variety of the contraction. This may be laid down as an axiom for every abnormal presentation, because the proper method of treatment for such malpresentations is not the treatment of the abnormal presentation as such, but that of the contracted pelvis, which is the causative factor.

When an oblique lie is recognised in the later weeks of pregnancy, every effort should be made to correct it into a more favourable presentation, preferably vertex, by external version. We should like, however, to warn the practitioner against imagining that once an oblique lie has been corrected into a vertex or a breech it will necessarily remain as such. It is desirable that the woman should be seen at periodic intervals to verify whether the corrected presentation remains as such; and in every case where an oblique lie has been rectified the patient should be warned to summon medical assistance as soon as labour begins and not to walk about in the first stage of labour. We have not infrequently seen cases where, after correction, an oblique lie has recurred; and if this warning to the patient is omitted, the chances are that she will think that everything is proceeding favourably and thus not summon assistance at as early a stage as is desirable.

It may, however, be stated that in many instances an oblique lie noted, say, about the thirty-second week, rectifies itself into a vertex at a later stage of pregnancy. This does not, however, mean that attempts at correction of the presentation should not be made in the antenatal clinic whenever an oblique lie is recognised, in the third trimester of pregnancy.

We shall now consider the management of a case of oblique lie in the various stages of labour.

(1) *When the patient comes to you early in Labour, and the Lie is an oblique one.* Here the remedy is very simple. It must be converted into a more favourable presentation by external version. The conditions necessary for the satisfactory performance of external version are:—

- (a) The abdominal wall must be lax.
- (b) The uterus must be fairly lax.
- (c) The membranes must be intact.

After converting it into a more favourable presentation viz: vertex or breech, a tight abdominal binder should be applied to prevent the foetus from changing its position, and the woman should lie on her back and not walk about in the first stage of labour.

When external version fails, it is better to keep the patient at rest in bed and allow labour to progress till such time as the cervix is sufficiently dilated to permit of bipolar version, or in some cases internal podalic version.

(2) *When the woman comes in Labour, with the Cervix Dilated to Two Fingers and the Membranes intact.* In such cases external version may be possible, and if it does not succeed bipolar version should be attempted. The details with regard to the conditions necessary and the method of performing bipolar version are described elsewhere. It consists in manipulating with two fingers introduced into the cervical canal and the other hand placed on the anterior abdominal wall and the presentation corrected to a more favourable one by pushing the part that is at the lower pole away and bringing down the cephalic or podalic pole into the brim of the pelvis. Bipolar version is also possible immediately after rupture of the membranes, when there is still a sufficiency of liquor amnii, and it may therefore be tried in such cases. It is, however, out of question if any part of the foetus has prolapsed through the cervical canal.

(3) *Woman in Labour, Membranes ruptured.* Before deciding upon any particular method of treatment, two conditions must be noted:—

- (a) The condition of the uterus.
- (b) The condition of the foetus; that is, whether it is alive or dead.

(a) *Condition of the Uterus.* Once the membranes have ruptured the contractions of the uterus become more frequent and the liquor amnii drains away, with the result that the uterine musculature comes to press upon the foetus directly. The uterine muscle in a woman in labour may be acting in varying ways during the 2nd stage of labour. Thus the uterus may be:—

- (1) Contracting and relaxing at intervals as in the first stage of labour.
- (2) Contracting at frequent intervals and for fairly long periods with very little relaxation in between.
- (3) In a state of continuous contraction with little or no relaxation.
- (4) May be tonically contracted so that there is no interval of relaxation at all.

- (5) May be tetanically contracted, where on a tonically contracted uterus there are superimposed waves of uterine contraction.
- (6) Threatening to rupture where, owing to continued contractions of the uterus, the lower uterine segment has become dilated and the walls thinned out, with Bandl's ring high up, so that rupture of the uterus is imminent.
- (7) Uterus may actually rupture or in rare cases, may pass on to secondary uterine inertia.

In any case, therefore, where interference is indicated after rupture of the membranes in a case of oblique lie, it is of the utmost importance that the actual condition of the uterus is first ascertained.

In this connection it may be stated that occasionally the Bandl's ring or retraction ring is present on the posterior wall of the uterus and may not be palpable on the anterior wall; and not till the patient is under anaesthesia and an attempt at internal podalic version made is the presence of such a posterior Bandl's ring recognised.

(b) *Condition of the Foetus.* Equally important it is to recognise the condition of the foetus, whether it is alive or dead, and if alive what are the possible chances of its survival after delivery. Manipulative interference with a view to save the child may necessitate a certain amount of risk being taken so far as the mother is concerned. But it will be entirely unnecessary and unjustifiably hazardous to attempt to do the same manipulative interference when the child is dead.

It is obvious, therefore, that the particular mode of treatment to be adopted will be determined largely by the condition of the uterus and of the foetus.

We shall now take the different conditions of the uterus and foetus above described and deal with them *seriatim*.

(1) *Membranes ruptured, Uterus contracting and relaxing, Foetus alive.* Here the method of treatment will depend upon the degree of dilatation of the cervix. In some cases where there is no particular urgency for interference it is well to let the uterus to contract for some time longer and so allow the cervix to dilate, care being taken to watch the condition of the uterus and the foetus. If the cervix is fully dilated or dilatable there is no object in allowing labour to progress longer, and the method of treatment to be adopted is as follows. After the external genitalia have been thoroughly cleansed and due antiseptic precautions taken, the

patient is anaesthetised so as to relax the uterus and abdominal muscles. The hand, with a sterilised glove on, is carefully introduced into the vaginal cavity, passed through the cervix and guided to where the breech is lying. The fingers are pushed along the posterior aspect of the foetal thigh, on to the knee, and pressure is applied at the popliteal space with a view to promoting flexion of the knee. As soon as the knee is slightly flexed the forefinger may be passed along the shin till the foot is reached, and the foot is grasped between the thumb, index and middle fingers and gradually brought down. If dilatation of the cervix is complete, further delivery may be proceeded with and the breech extracted by gentle traction upon the foot.

If the dilatation of the cervix is not sufficient it is better to bring a foot down to the vulva and leave it there, so that the cervix may dilate with further uterine contractions and the delivery be completed spontaneously. We again emphasise the dangers associated with any attempt to deliver a breech presentation through an incompletely dilated cervical canal.

(2) *Membranes ruptured, Uterus contracting and relaxing, Arm prolapsed, Foetus alive.* In such cases the arm, if it is prolapsed outside the vaginal cavity, should be thoroughly cleansed, dried with a sterile towel, painted with tincture iodine or any suitable antiseptic and a piece of sterile gauze tied as a loop round the wrist so as to prevent the arm becoming extended in subsequent manipulations. The patient is anaesthetised and after emptying the bladder the operator passes his hand with the sterilised glove on and performs internal podalic version in a manner similar to that described above. If the cervix is fully dilated the delivery may be completed; otherwise the foot is brought down and left there and spontaneous delivery awaited, or if there is any necessity for interference extraction may be done after full dilatation of the cervix.

(3) *Membranes ruptured, Uterus fairly strongly contracting, the Arm prolapsed outside the Vaginal Outlet and Foetal Heart inaudible.* Here, as the foetus is dead, there is no object in adopting measures usually taken when the foetus is alive. The question naturally arises whether the arm that has prolapsed outside and has naturally been infected should be allowed to recede into the vaginal or uterine cavity. Theoretical considerations warrant the removal of the prolapsed arm to avoid possibilities of septic infection. After taking due antiseptic precautions, disarticulate the prolapsed arm at the shoulder joint and perform internal podalic version and deliver the foetus in the manner described above. It may be emphasised that the removal of the arm should be by

disarticulation, whereby the smooth glenoid cavity is exposed, and not by amputation which involves cutting through bone and so leaving spicules of the cut end to recede inside and possibly tear the uterus or vagina. We are, however, of opinion that it is unnecessary to do this mutilating operation for two reasons. The prolapsed arm can be suitably treated with antiseptics so that the possibilities of infection are reduced to a minimum; secondly, and this is the more important consideration, we have already referred to the possibility of a Bandl's ring being occasionally present in the posterior wall of the uterus and not recognised by ordinary methods of abdominal palpation. We have experienced considerable difficulty in performing internal podalic version after disarticulation of the arm in the presence of such Bandl's ring, and in one instance the patient had to be delivered by Cæsarean section followed by hysterectomy. Where such a Bandl's ring is present and internal podalic version is not possible, if the prolapsed arm is not disarticulated the next method of delivery, namely decapitation, is possible. For these reasons we hold that it is unnecessary and occasionally inadvisable to disarticulate the prolapsed arm of a dead foetus, and we have ourselves given up this practice for some years past. We take usual antiseptic precautions and perform internal podalic version and complete the delivery in the usual manner failing which decapitation is done.

(4) *Membranes ruptured, Uterus contracting strongly with little relaxation, Foetal Heart audible or doubtful.* In such cases the patient should be given deep chloroform anæsthesia and a more thorough examination made by introducing the hand into the vagina. Occasionally it is possible to feel the pulsations of the cord definitely, although the foetal heart may not be quite so easily audible. In such cases under deep anæsthesia the gloved hand may be passed inside the uterine cavity and internal podalic version performed with care and the child delivered.

(5) *Membranes ruptured, Uterus tonically contracted, Bandl's Ring present, Foetal Heart audible.* These cases really present a great deal of difficulty and sound judgment is required on the part of the obstetrician. The essential factor to be remembered is that the foetal heart is audible and efforts should therefore be made to save the child. The patient should be given $\frac{1}{4}$ to $\frac{1}{2}$ grain of morphia to produce as much relaxation as possible, followed by deep chloroform anæsthesia, and with great care the operator should pass his hand inside the uterus and gently bring down a foot. Once the foot has been brought down judicious care should be exercised in maintaining a continuous, steady traction, allowing plenty of time for the foetus to change its lie and for the uterus to accommodate itself

to the changed position. Any sudden pull causing a greater amount of tension on one side or other of the uterus is likely to lead to rupture of the organ. In such cases, when the hand is passed inside the uterus, the effect of the uterine contractions is to benumb the hand and make a grip impossible. Occasionally it is wise for the obstetrician to remove his hand which has been practically paralysed and quickly introduce the other hand, seize a foot before the fingers are benumbed and bring it down. It may perhaps be admitted that the manipulations that are required in such a condition are so delicate that only one who has had sufficient experience at internal podalic version should undertake them; but in the absence of such experience, and for the beginner, we would definitely advise the next method of procedure, which is a method to be adopted when the foetus is dead. Frankly a cumbersome and none too delicate attempt at manipulation may provoke rupture of the uterus and may result in a dead foetus and a dead mother, so that it should not be lightly undertaken by the junior practitioner.

(6) *Membranes ruptured, Uterus tonically contracted, Prominent Bandl's Ring present, Foetus dead.* Here the question of the foetus does not arise at all, and therefore the operation that we have been describing so far, internal podalic version, is quite unnecessary. Having therefore ruled out the possibility of internal version, what are the methods of delivery available under such circumstances? It depends upon whether the arm of the foetus is prolapsed or not. If the arm of the foetus is prolapsed outside the vaginal outlet the operation of choice is decapitation. This is done as follows:—

Decapitation. After the usual antiseptic precautions are taken and the bladder has been emptied, the prolapsed arm is pulled down, the two fingers of the hand of the operator are passed inside so as to locate the neck of the foetus, and a decapitating hook with a cutting edge is passed with the knob directed posteriorly round the neck of the foetus. The head is severed from the trunk. This can also be done, and sometimes more effectively, by using a long pair of scissors, sharp edged and blunt pointed, cutting through successive portions of the neck and the spinal column, guiding the scissors by the two fingers already introduced into the vaginal cavity. We ourselves prefer decapitation by the scissors as a more satisfactory procedure.

After decapitation has been completed delivery is effected by traction on the prolapsed arm when the headless trunk slips out easily. The head is delivered by fundal pressure, aided by two fingers in the vagina hooked into the mouth as in a case of the after-coming head in a breech presentation. If there is any

difficulty in the delivery of the head, the head may be grasped by a volsellum, perforated and delivered.

Where the arm is not prolapsed and the back of the child is presenting, the method of delivery is by spondylotomy. Here the body of the child is cut into two by dividing the vertebral column, and after this has been done the two parts of the trunk are delivered one after the other, by pulling with volsellum or by a hook. We must emphasise the fact that either after decapitation or after spondylotomy no attempt should be made to pass the hand inside the uterus and bring down a foot. It is obvious that any such attempt defeats the very purpose of these operations, and leads to the possibility of rupture of the uterus.

Occasionally one meets with a case where an oblique lie is complicated by a contraction ring so that none of these manipulations are possible. In such cases one has to face the necessity of delivering the foetus through the abdominal route and performing a hysterectomy at the same time.

Lastly, in cases where the uterus has already ruptured and the arm is prolapsed, the treatment will naturally be directed to the rupture of the uterus rather than to the malpresentation. We deal with all aspects of this question in the chapter on rupture of the uterus; but we may state where the conservative method of treatment for rupture of the uterus is adopted, the foetus should be delivered in the manner suggested above by decapitation or spondylotomy if it is possible, and the rent in the uterus treated on the conservative lines which will be outlined later.

We may summarise our treatment of shoulder presentation by stating that in uncomplicated cases there should be no serious additional danger either to the mother or to the foetus if proper steps are taken at an early stage; that in some cases it is possible to convert the presentation into a more favourable one by external version, bipolar or internal podalic version; that the subsequent manipulations necessary to deliver the child need not necessitate any increased risks to the mother; that where unfortunately the woman has been allowed to go on long in labour and is seen at a late stage in the condition known as a neglected shoulder presentation, where the arm has prolapsed and the shoulder is jammed in the vaginal cavity with the uterus tonically contracted and Bandl's ring present, nothing is gained by unnecessary manipulations, especially by those with little or no experience, and the safest line of treatment is to decapitate the foetus and deliver it. The chances of sepsis must be borne in mind and suitable precautions taken. Where the child is alive, preparations must be made to treat the child after delivery for asphyxia neonatorum which is not unlikely.

The Place of Cæsarean Section in the Treatment of an Oblique Lie. We hold that in uncomplicated cases of oblique lie there is no necessity to think of a Cæsarean section as an operation of choice. It may, however, be indicated in the following circumstances :—

- (1) A relatively contracted pelvis. The danger in such a condition is obvious. Although the difficulties of rectification or of version are not increased the subsequent delivery is, and so the chances of survival of the foetus are definitely less with any degree of contracted pelvis, and in the interests of the mother and child Cæsarean section may be the operation of choice.
- (2) In elderly primiparæ with an oblique lie a Cæsarean section may have to be thought of in view the difficulty of cervical dilatation, as well as the risks to the foetus in the subsequent breech delivery.
- (3) In cases complicated with placenta prævia a Cæsarean section may sometimes be necessary. Although in such cases it is often possible to perform podalic version and bring down the foot, the possibilities of the foetus surviving are somewhat remote and one may therefore be inclined to resort to Cæsarean section. Further, the degree of placenta prævia may indicate Cæsarean section as the safest method of delivery for the mother.

CHAPTER XXX

PRESENTATION OF THE CORD: PROLAPSE OF THE CORD

By the term presentation of the cord is meant the condition where the cord lies in front of the presenting part before rupture of the membranes. Prolapse of the cord implies that the cord is in front of the presenting part after rupture of the membranes.

At the Women and Children's Hospital, Madras, prolapse of the cord was noted in 83 cases out of 20,420 confinements, giving a proportion of 1 in 246.

Ætiology. Three conditions may favour the occurrence of prolapse of the cord :—

- (1) Factors which tend to interfere with the close application of the presenting part to the lower uterine segment and brim of the pelvis.
- (2) An excessive amount of liquor amnii, as in hydramnios.

- (3) Anomalies of the cord itself, either as regards its length or its attachment to the placenta.

(1) *Factors which interfere with the close application of the Presenting Part to the Lower Uterine Segment and Brim of the Pelvis.* In cephalic presentations the head of the foetus usually fills the lower pole of the uterus and generally engages in the brim of the pelvis in the last weeks of pregnancy or at the onset of labour. This may not, however, occur in cases of contracted pelvis, tumours about the brim of the pelvis, placenta prævia, and in malpresentations such as face, brow, breech, shoulder or compound presentations. All these conditions, therefore, may be factors in the causation of prolapse of the cord.

(2) *Hydramnios.* In this condition two factors are involved in causing prolapse. Owing to the excess of liquor amnii the presenting part does not fill the lower uterine segment or fix at the brim of the pelvis, and in many cases an abnormal presentation also co-exists. The second factor is that when the membranes rupture, the gush of liquor amnii frequently washes the umbilical cord down in front of the presenting part, resulting in prolapse of the cord.

(3) *Anomalies of the Cord.* An unduly long cord may occasionally cause prolapse. The normal length of the umbilical



FIG. 127.—Prolapse of the cord.

cord varies between 18 and 22 ins. Cases, however, are on record where the cord measured as much as 36 to 40 ins., and in such cases there is a possibility of the cord slipping in front of the presenting part, more so if one of the other factors mentioned above be also present.

When the cord is attached to one edge of the placenta—and that is the lower edge—there is a greater tendency for a portion of the cord to slip in front.

For the same reason a low insertion of the placenta may cause prolapse of the cord.

Any of the factors mentioned above may cause presentation of the cord, and lead to its prolapse. In several cases more than one factor may be responsible for the condition.

Course. In the absence of complications such as contracted pelvis, malpresentations, etc., the course of labour may not be interfered with on account of this condition; but if not diagnosed and rectified in time, labour will end in a still-birth. As, however, in the large majority of cases of prolapse of the cord some one or other of the complications mentioned above is present, the course of labour is greatly altered.

Diagnosis. The diagnosis of this condition is fairly simple and is made by a vaginal examination.

In presentation of the cord the pulsations of the cord may frequently be felt through the intact membranes. When the cord has prolapsed a loop may be seen lying outside the vagina and the diagnosis is obvious; but when it is still within the vagina or high up it may sometimes be mistaken for intestines of the foetus or the mother—more often the former which may occur in a case of *exomphalos*. If the cord pulsates there is no likelihood of any mistake being made, but care should be taken to see that the cord is not unduly compressed for any length of time, as this increases the shock to the foetus and favours asphyxia. The cord can be distinguished from a prolapsed intestine by the fact that with a piece of bowel, foetal or maternal, the mesenteric attachment can always be defined, whereas the umbilical cord is free. It must be remembered that the child is not always dead, even though pulsations in the cord are absent. Occasionally during a uterine contraction the pulsations may cease but return when the contraction passes off. In some cases the pulsations have just ceased but the child is still alive. It is a wise precaution, therefore, to auscultate for the foetal heart sounds if the pulsations are not easily felt by vaginal examination. The warmth of the umbilical cord, the fact

that it is still fairly full and the condition of the uterus, suggest the possibility that the pulsations have stopped recently. It is important to note these points, as under such circumstances rapid delivery, wherever possible, may save the child.

It is again stressed that in all cases of labour where the presenting part is not fixed in the brim of the pelvis, a vaginal examination is essential as soon as the membranes rupture to see if prolapse of the cord has occurred. Irregularities in the rate of the foetal heart sounds during the first stage of labour indicate interference with the foetal circulation and the possibility of a funic presentation must be fully investigated.

Prognosis—Foetal. The chief danger of this condition is to the foetus. The foetal mortality is very high. The prognosis is worse when the presentation is cephalic than when it is pelvic. It also depends upon the following additional factors:—

- (1) Presence of complications, such as contracted pelvis, placenta praevia, hydramnios.
- (2) The degree of the dilatation of the cervix and whether the cervix is soft and dilatable.
- (3) Whether the patient is a primipara or a multipara.
- (4) Whether the uterus is contracting or not.
- (5) The extent of the prolapse.
- (6) The nature of the treatment adopted.

Maternal. So far as the mother is concerned, in the absence of any complications prolapse of the cord need not render the prognosis worse; but as the condition is more often associated with some complications, and as in the large majority of cases interference is called for in the interests of the foetus, the prognosis for the mother also is rendered less favourable.

Treatment. The treatment to be adopted in any particular case of presentation or prolapse of the cord depends upon several factors. Among these may be mentioned:—

- (1) Whether the patient is a primipara or a multipara.
- (2) Any contraction of the pelvis and the degree of such contraction.
- (3) Whether there is a malpresentation, and if so of what variety.
- (4) Whether the foetus is premature or full term.
- (5) Whether the membranes are intact or ruptured.

- (6) The extent to which the parturient canal is dilated or dilatable.
- (7) The condition of the foetus as indicated by the umbilical cord, pulsating or pulseless.

Presentation of the Cord. In this condition underlying cause should be ascertained. Where it is due to definite contraction of the pelvis and the consequent non-engagement of the presenting part, the treatment is naturally directed to deal with the contracted pelvis. In other cases our first object is to prevent rupture of the membranes so that the condition may not become one of prolapse of the cord.

Postural Treatment. Presentation of the cord may be corrected by the postural method; this consists in putting the patient in a posture where the fundus of the uterus is at a lower level than the lower uterine segment. The cord then gravitates towards the fundus in consequence of the presenting part receding from the lower uterine segment.

The postures adopted are:—

- (1) Knee-chest or knee-elbow position.
- (2) Trendelenburg position.
- (3) The elevated Sim's position.

When any of these three positions is adopted the pelvis is elevated and the chest and upper abdomen lowered. After the cord has slipped away from the lower pole of the uterus the woman is made to lie on her back and the presenting part is pressed down into the brim of the pelvis and a tight abdominal binder applied. It is, however, necessary to watch the foetal heart carefully from time to time, and if there be any irregularity to make a vaginal examination to ascertain whether the cord has once more slipped down.

Where the conditions are favourable it is advantageous to convert the presentation into a breech, as in such cases the cord is less likely to be compressed than in a cephalic presentation. In cases where the cervix is fully dilated, or nearly fully dilated, and the presenting part is not fixed, it is well particularly in multiparae to rupture the membranes, perform an internal podalic version and deliver the foetus.

Prolapse of the Cord. In the treatment of this condition two factors should be definitely ascertained:—

- (a) Whether the cord is pulsating or has recently stopped pulsating.
- (b) The causative factor responsible for the prolapse.

Whenever the condition is diagnosed, immediate interference is indicated if the child is to be saved. It is well to raise the foot of the bed and keep the pelvis elevated, so as to prevent pressure by the presenting part on the prolapsed cord while preparations are being made for its treatment.

If the cord is pulsating the treatment consists in :—

- (1) Reposition of the cord, or
- (2) Immediate delivery.

Reposition of the Cord. This may be done either by means of an instrument—the funis repositior—or by means of the fingers. In either case considerable help can be obtained by putting the patient into one of the postures recommended for correction of presentation of the cord and then replacing the cord either by the funis repositior or, where it is possible, by the fingers. Occasionally the whole hand may have to be introduced into the vagina and uterus to allow of the prolapsed cord being carried beyond the presenting part, and so the patient must be anaesthetised and then put in the Trendelenburg position. After reposition of the cord the woman must be made to lie on her back; and to prevent the cord from getting prolapsed again it is advantageous to insert a hydrostatic dilator such as Champetier de Ribes' bag. The bag, if properly used, will fill the lower uterine segment, prevent the cord from becoming prolapsed, will stimulate the uterus to contract and uniformly dilate the cervix; when it is expelled the whole genital passage will be sufficiently dilated and so ready for immediate delivery. In case there is any tendency for the cord to prolapse again delivery can be expedited by version or, where it is possible, by the application of forceps. If a hydrostatic bag is not available, attempts should be made to get the presenting part fixed after reposition of the cord. This can be done by the application of a tight abdominal binder and by stimulating the uterus to contract with a small dose of pituitary extract ($\frac{1}{4}$ c.c.) or in the alternative by the application of Willett's Forceps.

In some cases where the cord is replaced by a funis repositior there may be a tendency for it to prolapse again when the funis repositior is being withdrawn, and in such cases it is as well to

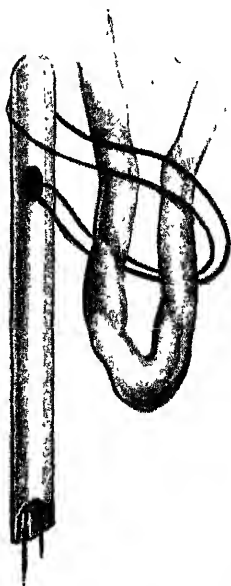


FIG. 128.—Replacement of the prolapsed cord with a repositior.

leave the repositor *in situ* after replacement and allow labour to progress.

In cases of elderly primiparæ, in conditions where the pelvis is contracted, in cases of placenta prævia, or when the life of the foetus cannot be jeopardised owing to a long period of sterility of the mother, it is sometimes necessary to resort to Cæsarean section.

Where the cervix is one or two fingers dilated and somewhat hard and rigid, Cæsarean section may be the only method of saving the life of the foetus, but where it is undertaken the foetal heart must be definitely audible and the child at or near term.

If the os is fully dilated or nearly so there is little advantage in trying to replace the cord and risking the possibilities of a prolapse occurring again. In such cases immediate delivery is the safest method. The method adopted depends upon the part presenting and whether it is fixed or not. Wherever the presenting part is not fixed internal podalic version may be performed and the child delivered. In those cases where the os is not fully dilated but is dilatable, the os should first be fully dilated before version and extraction are attempted. Similarly, in cases where the head is fixed, it may sometimes be advisable to extract it with forceps should conditions for the safe application of forceps be satisfied.

If the cervix is not fully dilated and the cord prolapsed and pulsating but not replaceable, the cervix may have to be dilated manually or cervical incisions made according to the method advocated by Dührssen. In some cases a vaginal hysterotomy may be indicated. Whatever method of completing cervical dilatation is adopted, the child is finally delivered by version and extraction, or by forceps.

Where conditions are not favourable for immediate delivery it is sometimes desirable to replace the cord, convert the presentation into a breech and leave the delivery to nature, watching the foetal heart carefully from time to time.

If the cord is cold and pulseless and the foetal heart inaudible, consideration for the foetus does not arise, and interference is only necessary to deal with any underlying causal condition which will endanger the mother's life. The large majority of cases may be left to nature and spontaneous delivery awaited. Where spontaneous delivery does not take place, if the head is presenting, this may be completed by forceps, or if necessary after craniotomy. In cases where the breech is presenting extraction is undertaken, and if there is any difficulty with the after-coming head perforation may be performed. The most conservative method of treatment

which is consistent with the interests of the mother should be adopted.

In cases where prolapse of the cord occurs and the foetus is not viable, the treatment outlined for the condition when the cord is pulseless should be adopted.

COMPOUND PRESENTATION

By this is meant the condition where more than one part of the foetus presents at the brim of the pelvis at the time the patient goes into labour.

Varieties. The commoner forms are: (1) Head and hand and (2) head and foot. More rarely the hand and foot may present

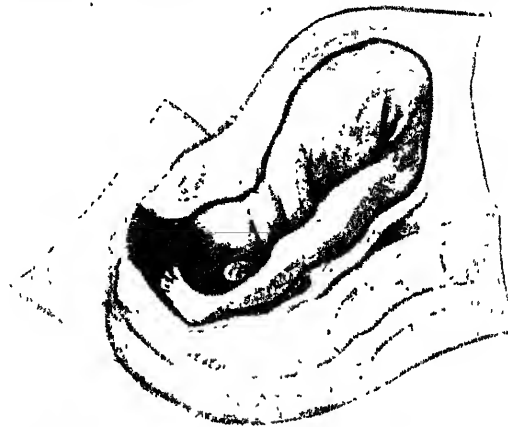


Fig. 129.—Compound presentation: head and foot.

together; and rarer still head, hand and foot may all three present simultaneously.

Ætiology. Compound presentation may occur either in cases of contracted pelvis or in cases where the pelvis is too roomy, as in the pelvis *equiliter justomajor*. In some forms of contracted pelvis such as the flat variety, the head does not engage and hence it is occasionally possible for a hand to slip alongside the head. In the *justomajor* pelvis the roomy inlet may permit of the hand slipping past the side of the head even when it has engaged. With a premature foetus the same condition may result with a normal pelvis owing to the relative disparity in size between the presenting part and the pelvic inlet.

Diagnosis. It is impossible to diagnose this condition by abdominal palpation. A vaginal examination is the only method of diagnosis. A cursory vaginal examination may reveal the presentation of the hand or foot and may, in the first instance,

mislead the obstetrician into believing that he is dealing with a case of transverse lie or breech presentation. But if a more thorough examination is made of the presenting part it will be obvious that the hand lies to one side and that the cephalic pole is presenting. In some cases the hand may actually be lying outside the vulva while the head is in the pelvic cavity. More

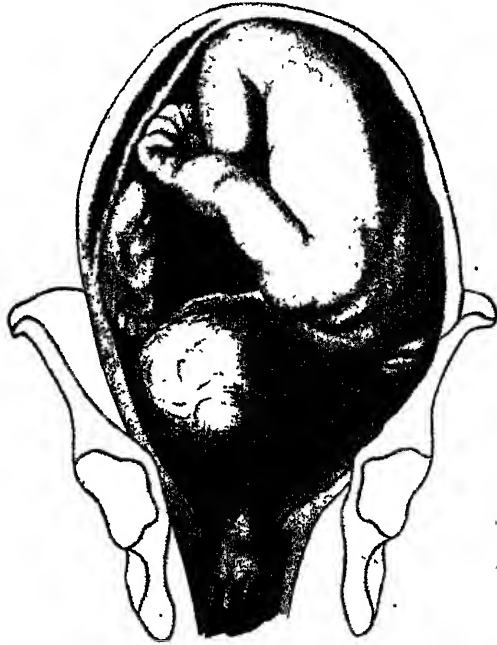


FIG. 130.—Compound presentation: head and hand.

rarely we have seen the foot prolapsed outside with the head either in the pelvic cavity or at the brim.

The cord may occasionally be found prolapsed together with any of these conditions.

Course. In a compound presentation the simultaneous attempt at engagement of two parts of the foetus naturally results in a degree of disproportion, so that unless the pelvis is very roomy or the foetal parts comparatively small in size, the uterine contractions may not be sufficiently strong to force the parts down, and effect spontaneous delivery. Owing to the delay, however, the foetus is subjected to a greater amount of risk. In the majority of cases of compound presentation such a favourable termination does not occur. There is obstruction to the progress

of labour and signs of foetal or maternal distress manifest themselves in course of time.

Prognosis. From what has been stated above it is obvious that the prognosis is definitely worse so far as the foetus is concerned and may, if effective assistance is not available, lead to an unfavourable prognosis for the mother as well. As interference is usually necessary the risks to both the mother and the child are increased.

Treatment. The main principle to be remembered in the management of compound presentations is to correct the presentation so that only one part of the foetus presents.

1. **Head and Hand—Before Rupture of Membranes.** The postural method of treatment may be adopted in such cases. The patient is made to lie on the side opposite to that on which the hand is presenting and the pelvis elevated slightly by raising the foot of the bed. This will help in displacing the arm towards the fundus of the uterus and when the pains come on the head may engage. The patient should be kept in this position for some time till the pains have become fairly strong, fixing the head properly.

If the cervix is fairly well dilated, particularly in multiparae, it may be advisable to rupture the membranes, perform version, and bring down a foot. The delivery may then be completed should the condition of the cervix permit, or it is left to nature if the os not sufficiently dilated.

After Rupture of the Membranes. In this case the treatment will depend upon whether the head is already engaged or not. An attempt should be made in every case to push the arm upwards past the brim of the pelvis, preferably with the patient under anaesthesia. If this does not succeed, and if the head is not yet engaged in the brim of the pelvis, internal podalic version may be the most suitable method of treatment, provided the conditions are satisfactory for its performance. In cases, however, where the head is already engaged in the brim of the pelvis and the arm is lying by its side, labour may be allowed to take its own course. Occasionally spontaneous delivery may occur, the head being born past the obstruction offered by the prolapsed hand; but if delivery does not take place and signs of foetal distress make themselves evident, forceps can be applied and the head extracted. Care must be taken in applying forceps to see that the arm is not caught between the blades of the forceps.

If the foetal heart is inaudible and the child is obviously dead, the head may be perforated and delivery effected.

2. Head and Foot. This is a rare condition, and in the majority of cases if the head is not actually engaged in the brim of the pelvis, the child may be extracted by traction on the prolapsed foot thus converting the presentation into a breech.

Where, however the head is trying to engage in the brim of the pelvis, the foot may be pushed upwards and the head fixed in the brim by combined manipulation. If the head has already engaged in the brim with the foot alongside and the foot cannot be pushed up, labour may be allowed to progress provided a careful watch is kept on the condition of the uterus and the foetal heart. At any time when signs of foetal distress arise the head can be extracted with forceps.

If the child be dead and the head is engaged, craniotomy may be done and delivery completed if there is delay.

Prolapse of the Cord with Compound Presentation. The treatment in such cases is directed mainly to the condition of prolapse of the cord, irrespective of the presence of the compound presentation. Whenever possible it is desirable to complete delivery by version and extraction. The general principles to be borne in mind have been dealt with in the chapter on prolapse of the cord.

CHAPTER XXXI

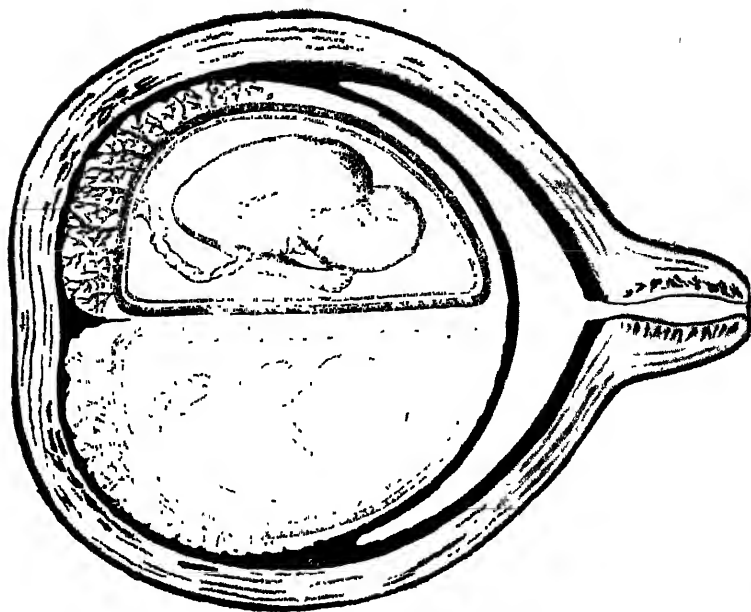
MULTIPLE PREGNANCY

MULTIPLE pregnancy means the simultaneous development of more than one foetus in the uterus. In the human species it is usual for only one foetus to develop during pregnancy, but sometimes two grow simultaneously; triplets, quadruplets, quintuplets and even sextuplets have been recorded.

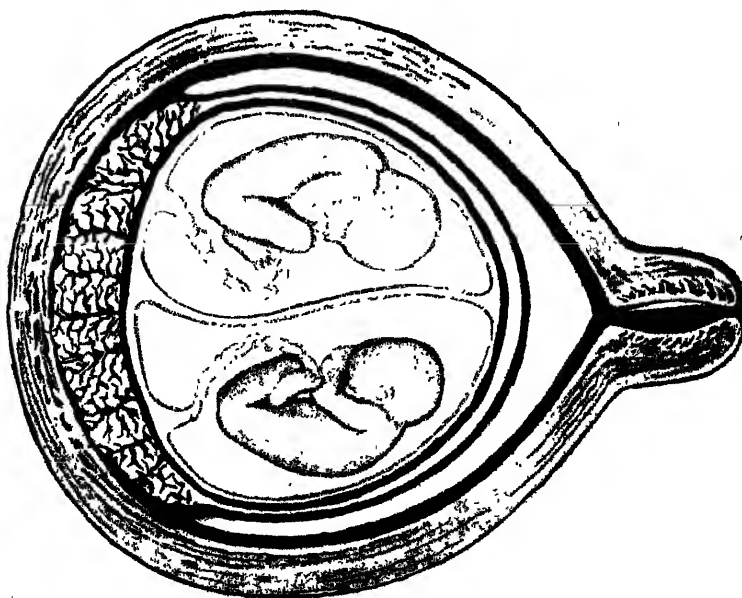
Twin pregnancies are not infrequent. At the Women and Children's Hospital, Madras, 257 cases of multiple pregnancy occurred in 20,420 confinements, giving a proportion of 1 in 79. Triplets occurred in 4 cases and only one case of quadruplets was recorded among 54,000 deliveries during the period 1920-1935. Cases of quintuplets and sextuplets are extremely rare.

Ætiology. The cause of twin pregnancy is not clear. There is no doubt that there is a hereditary predisposition which it is stated is more generally transmitted through the female, so that there are records of families where twin pregnancy has occurred in succeeding generations, although sometimes one generation may be missed.

MULTIPLE PREGNANCY



B. Binovular.



A. Uniovular.

FIG. 131.—Twin pregnancy.

Varieties. There are two varieties of twins commonly noted, namely, uniovular and binovular twins.

Uniovular twins result from the fertilisation of a single ovum, whereas *binovular twins* are derived from separate ova. Uniovular twins are always of the same sex and resemble each other very closely. There is one common placenta and only one chorion, although there is a separate amnion for each foetus. Occasionally the amniotic membranes may fuse or atrophy, leaving both foetuses to occupy a common space bound by the chorionic membrane. In binovular twins there are always two separate placentæ which

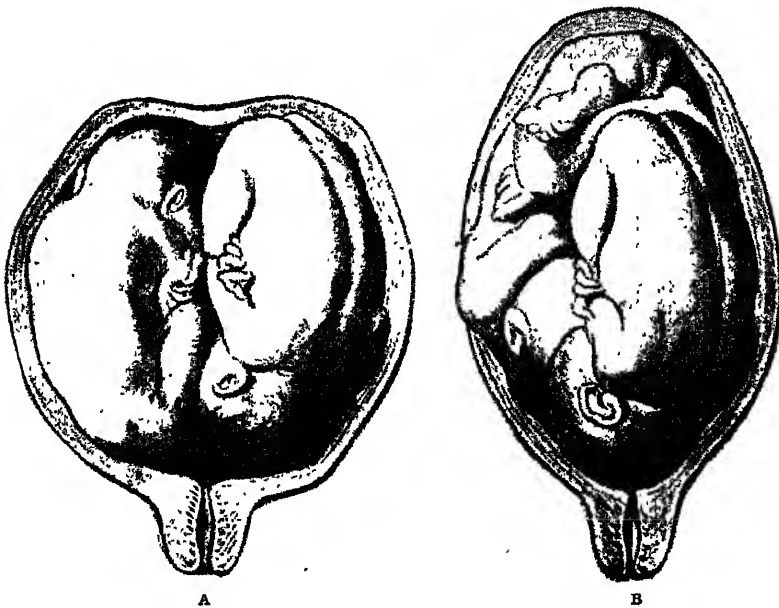


FIG. 132.—Twins.

A. Vertex and breech. B. Both vertex.

are occasionally fused to each other, thus giving the appearance of a single one, but they are essentially separate and there is no intercommunication between their circulations. Each foetus has got its own chorionic and amniotic sac. The foetuses may be of the same or of different sexes and they may not resemble each other closely.

Twins are usually smaller than the child of a single birth, but the combined weight of the two is greater than that of a single child. In the majority of cases delivery is premature, probably due to the greater distension of the uterus caused by the plural pregnancy. In some cases the twins differ considerably in size, which may be due to the relatively larger amount of blood

supply passing to one foetus at the expense of the other. This disproportion in the placental circulations may sometimes be so extreme that one foetus monopolises practically the whole of the blood supply, and consequently the second twin dies. In such cases of intra-uterine death, one foetus gradually becomes dried up and mummified. The pressure exerted by the other living and growing foetus, so compresses and flattens the mummified one that it forms a *foetus papyraceous*.

Presentations. Malpresentations are more frequent in plural births which also tend to be associated with hydramnios. In the majority of instances twin pregnancies present as both vertex or as



FIG. 133.—Twins, both transverse.

vertex and breech. The combinations of presentations, in their order of frequency, are:—

Both vertex.

Vertex and breech.

Both breech.

Vertex and shoulder.

Breech and shoulder.

Both shoulders.

Course of Pregnancy. There is a greater tendency for some of the subjective symptoms to be exaggerated in cases of twin pregnancy. Thus nausea and vomiting are often excessive and persist for a longer period than in a single pregnancy. Owing to the unduly enlarged size of the uterus and the greater amount of pressure exerted on the abdominal viscera and surrounding structures, pressure symptoms may also manifest themselves in

the course of pregnancy; thus cedema of the lower extremities, varicosity of the veins, constipation, frequency of micturition and difficulty in respiration, with palpitation and pain in the precordial region are not infrequent. The patient may experience a greater amount of fatigue, backache, indigestion, sleeplessness and difficulty in locomotion on account of the distension. All these symptoms will be exaggerated in cases where hydramnios coexists with twin pregnancy. Premature labour is likely to be more frequent in cases of twin pregnancy than in single births. There is a greater tendency for the toxæmias of pregnancy to manifest themselves in the later weeks of a twin pregnancy.

Diagnosis. Twins are more easily diagnosed than triplets or quadruplets. In fact it may be stated that triplets and quadruplets have been diagnosed generally after radiographic examination.

It is difficult to make a positive diagnosis by abdominal palpation alone unless essential parts of the two foetuses, such as two cephalic poles can be palpated. The diagnosis is usually obvious on radiographic examination.

Inspection. The greater amount of uterine distension suggests the possibility of a twin pregnancy. In some cases the excessive amount of foetal movement felt by the patient all over on either side of the abdomen and occasionally seen by the obstetrician on inspection leads one to suspect a twin pregnancy.

Abdominal Palpation. Careful palpation may give reliable evidence of a twin pregnancy. To be definite, one must feel the cephalic poles of both foetuses distinctly. Occasionally it may be possible when the woman is in labour to make out the presence of one cephalic pole distinctly by vaginal examination and feel the other at the fundus by abdominal palpation.

Auscultation may be useful as a confirmatory sign, but we would not rely on the auscultatory findings alone to make a diagnosis. If two independent observers listening simultaneously hear two foetal hearts distinctly at two different areas, well separated from each other, the foetal heart rates differing in frequency by at least ten beats, the possibility is that it is a case of twin pregnancy.

In cases where twin pregnancy is suspected it is wise to obtain an X-ray photograph to confirm the diagnosis, particularly in those cases where the associated condition of polyhydramnios obscures both the palpatory and auscultatory signs.

Course of Labour. In an uncomplicated case of twin pregnancy, labour may not begin till full term. In the majority of cases, however, premature labour occurs. The first stage of labour is usually prolonged because of inefficient uterine contrac-

tions. Owing to the small size of the foetuses delivery is generally spontaneous.

The usual course of events is for the first child to be delivered spontaneously, after which the woman has a short period of rest. Generally within half an hour the pains once more increase in severity, the second bag of membranes ruptures and the second child is delivered, followed shortly afterwards by the delivery of the two placentæ. Occasionally the interval between the delivery of the first child and the second may be prolonged and last for a few hours, or very rarely for a whole day. Cases are on record where two or three days have elapsed between the delivery of the first child and that of the second, but these are exceptional. Equally rare is it to find that after the delivery of the first child the placenta of the first child follows. Yet another rare complication is that the placentæ of both twins may be expelled after the delivery of the first child, in which case the death of the second twin is inevitable, unless its immediate delivery is effected.

Prognosis—Maternal. The prognosis for the mother is definitely worse than in single pregnancy. During the course of pregnancy certain complications may occur. The increased tendency for toxæmias, such as hyperemesis, albuminuria and eclampsia, the possibility of hydramnios and the pressure symptoms from an overdistended uterus, all add to the risks during pregnancy.

During labour the prolongation of the first stage, the necessity for interference to facilitate delivery and the possibility of post-partum hæmorrhage, increase the risks.

Fœtal. The fœtal prognosis likewise is not so good as in single pregnancies. One of the main factors concerned in this is the prematurity of the foetuses. Occasionally one foetus may develop at the expense of the other, so that the prognosis for one of the twins is very much worse.

The prognosis in cases of triplets and quadruplets is poor, as in most cases the labour is premature and the children very small.

Management of Labour. While in the majority of cases of twin pregnancy an attitude of watchful expectancy is all that is required during the management of labour, occasionally complications arise of a serious nature which require active interference.

In longitudinal lies, the first child should ordinarily be delivered spontaneously. Occasionally, where the first stage is prolonged, it may be of some help to rupture the membranes, the uterine contraction increase in force due to the escape of liquor amnii and the relief of the overdistension. From another point

of view this is desirable, as a prolonged first stage increases the risks of postpartum hæmorrhage later.

After the delivery of the first child the cord is ligatured at two places and cut between. Then the uterus is palpated to determine the presentation and position of the second twin. Usually this is easy to determine, as at this stage the uterus is relaxed and the foetal parts can be readily made out. We have, however, noticed that a large interstitial fibroid has been mistaken for a second twin, and even intra-uterine manipulations attempted with a view to deliver the supposed twin. A little more care in abdominal palpation, combined with vaginal examination if necessary, should enable one to avoid such a mistake.

After the birth of the first child it is desirable to allow the mother a short period of rest. In cases, however, where the second twin is presenting transversely, a podalic version should be done immediately by external manipulation. If this does not succeed we prefer to allow the woman to rest for about half an hour, at the end of which period, when the uterus has regained its tonus, the patient is anæsthetised and internal podalic version performed and the second foetus extracted.

If the second foetus is presenting in the longitudinal lie and is not delivered within an hour the membranes should be ruptured. If the uterine contractions are not effective to deliver the foetus, Kristeller's method for aiding expulsion of the foetus may be attempted. Should this fail and the ineffective labour pains continue, a small dose of pituitary extract (2 to 3 minims) may be given subcutaneously, or occasionally 3 or 4 drops of pituitary extract may be instilled intranasally. It is desirable to avoid the application of forceps as, with the head fairly high up and with a premature foetus, the chances of intracranial injury are much more pronounced. If, however, the uterus is contracting and the foetal head is in the mid-cavity and signs of foetal distress manifest themselves, forceps may be applied and delivery completed. Where the head, however, is high up a much safer method of delivery, both for the mother and the child, is to perform internal podalic version and extraction under an anæsthetic.

The management of the third stage of labour in cases of twin pregnancy requires great attention. As a measure of precaution everything necessary for the treatment of postpartum hæmorrhage should be readily available. Undue haste either in the delivery of the second foetus or in the expulsion of the placenta is to be avoided, and when hæmorrhage does occur it must be promptly treated.

It is well to remember that in some cases postpartum hæmorrhage may occur at a late stage, an hour or two after the expulsion of the placenta. The obstetrician should therefore watch the patient carefully, and should not be satisfied that hæmorrhage will not occur till the uterus has been firmly contracted and retracted for at least an hour after the expulsion of the placenta.

Anomalies of the placenta may also be met with, particularly the form known as membranaceous placenta. In such cases expression may fail and manual removal of the placenta may be necessary.

Complications. Apart from such complications as prolongation of the stages of labour, prolapse of the cord and the possibility of premature separation of the placenta, interlocking of the twins may occur. While this is a complication of a somewhat serious nature, it must be stated that it is exceedingly rare. The impression that locked twins is a common complication in the delivery of twin pregnancies is incorrect.

Several varieties of interlocking of twins may be met with. By the term "interlocking" we mean that the delivery of one twin



FIG. 134.—Interlocking of twins: the after-coming head of the first child obstructed by the descent of the head of the second.

second twin obstructing its further progress at birth canal. It may occur under the following

Fœtuses are presenting by the Cephalic Pole. The head of the first twin may attempt to descend into the pelvic canal, the head of the first resulting in a collision. It is the neck of the first and thus causes obstruction to the second. This is more likely to occur when the cephalic pole of the second is not sufficiently large to fill the brim of the

Child is presenting as a Breech and the other as a Cephalic Pole. The chin of the after-coming head may be caught by the chin of the second fœtus, the cephalic pole of the second fœtus, may try to descend and cause obstruction to the progress of the first child.

Breech, Second Child Transverse. Here the head of the first may get caught by the trunk of the second, across the pelvic brim, further progress being

presenting as a Vertex, the other as an Oblique. The head or neck of the first child may be caught by the trunk of the second child lying transversely, obstructing the progress of the head of the first child.

In this condition is made by a careful internal examination. If difficulty is experienced in the delivery of the first, anæsthetic is necessary and the whole hand is introduced into the uterus to make a thorough examination to determine the cause of the obstruction.

Where Dystocia is due to an attempt at Delivering the Heads in the Pelvis. In this condition the first child is placed in the Trendelenburg position, and under a general anæsthetic the whole hand is introduced into the vagina and the first child is pulled up out of the pelvis. The first fœtus may be delivered with forceps and the second child allowed to be delivered naturally; but if immediate delivery is indicated it may be done by the application of forceps, depending on the position of the head in relation to the pelvic cavity. If the head cannot be dislodged, forceps may be applied to the head and delivery attempted by gentle traction. If this fails, the condition of the first child does not permit of attempts to save it. Craniotomy should be performed on the head of the first child effected followed by the delivery of the second.

In rare cases of interlocking, provided both foetuses are alive and near full term, it may be justifiable to perform a Cæsarean section and thus save the twins.

(2) *Interlocking of the After-coming Head of the First Child with the Fore-coming Head of the Second.* This is perhaps the more common form of interlocking met with. In such cases the



FIG. 135.—Interlocking of twins: chin to chin.



FIG. 136.—Interlocking of twins.

Note that the after-coming head of the first is obstructed by the chest of the second.

head of the second child should be dislodged and pushed up. If this is found impossible, the only course open is decapitation of the first child, which is already partly born, and then extraction of the second twin, followed by the expression of the decapitated head of the first child.

(3) *Interlocking in Longitudinal and Oblique Presentation of Twins.* Under deep anæsthesia the second child should be pushed out of the way if possible and the first child extracted. Should this, however, not be possible, that only course open in the majority of cases is to sacrifice the first child either by decapitation or by craniotomy when the second twin is extracted after internal podalic version.

To summarise, then, the treatment of interlocking of twins consists in disentangling the interlocking by pushing the obstructing portion of the second foetus up and so permitting delivery of the first foetus. Where this is not possible the first child has generally to be sacrificed so that the second, which has a more favourable prognosis, can be delivered.

Lastly, we may in this connection refer to another condition that may occasionally be mistaken for interlocking of twins, namely, double monsters. They present difficulties in diagnosis and the treatment of this condition has already been dealt with in detail.

CHAPTER XXXII

DYSTOCIA DUE TO ANOMALIES OF THE EXPULSIVE FORCES

THREE factors are concerned with the phenomenon of labour and delivery of the foetus. For a safe delivery to occur it is necessary that:—

- (1) The foetus should be of normal proportions and should present in an attitude of universal flexion with the most favourable part of the foetus, viz., the vertex, as the presenting part.
- (2) The forces of labour—and by this we mean the contractions of the uterus and the expulsive efforts of the abdominal muscles which come into play late in the second stage of labour—should act in a physiological manner till the expulsion of the foetus and the third stage of labour are completed.
- (3) The passages, bony as well as soft, should not interfere with the descent of the foetus as it goes through the

various movements described collectively as the mechanism of labour.

Dystocia may therefore be due to:—

- (1) Faults in the passenger, the foetus.
- (2) Faults in the forces.
- (3) Faults in the passages.

We have already dealt with most of the faults in the passenger and the difficulties that may arise therefrom, together with the particular method of treatment that should be adopted in each case. We are now to consider the faults in the forces which may interfere with the normal course of labour.

The more common anomalies of the expulsive forces are due to:—

- (1) Unduly strong uterine contractions.
- (2) Weak uterine contractions.
- (3) Irregular uterine contractions.

(1) When the uterus is contracting too strongly it may lead to:—

- (a) Precipitate labour.
- (b) Tonic contraction of the uterus.

(2) When there are weak uterine contractions the condition may be due to:—

- (a) A sluggish uterus with weak pains from the onset of labour, generally spoken of as *primary uterine inertia*; or
- (b) An exhausted uterus, where after strong contractions the uterus has passed into a stage of exhaustion or atony. This condition is spoken of as *secondary uterine inertia*.

(3) Irregular contractions of the uterus may lead to the formation of a contraction ring or to tetanic contraction of the uterus in the second stage of labour, or an hour-glass spasm in the third stage.

Each of these conditions will be dealt with *seriatim*.

Precipitate Labour or Forcible Violent Expulsion of the Child

Labour is said to be precipitate when it terminates disproportionately shorter time than that taken on an average either by a primipara or a multipara.

The ætiological factors concerned in this condition are not easily determined. It occurs more frequently in multiparæ than in primiparæ, and is probably due to the fact that the soft parts are relaxed and the passages, including the patulous external cervical os, are in a way prepared by previous deliveries. It is more likely to occur in women with justo-major pelves and a foetus of normal size or in premature labours. We have seen precipitate labour occurring in certain cases of cardiac lesion and in women with extreme types of anæmia. Occasionally it may also occur in complications such as pneumonia during the course of pregnancy. It is not possible to anticipate this course of events except in those rare cases where a previous history suggests the possibility of precipitate labour occurring again. In such cases the patient ought to be advised not to risk any violent jolting or long distance rides in automobiles, and to avoid making sudden efforts of any nature. The uterine contractions may come on at very short intervals and are of longer duration, so that the contractions are almost continuous till expulsion of the foetus is completed.

Complications. Lacerations of the cervix, vaginal walls and of the perineum may occur. The chances of postpartum hæmorrhage are greater in such cases, as after such strong expulsive efforts of the uterus within so short a time uterine exhaustion supervenes in the third stage of labour. The shock associated with rapid expulsion of the foetus may also increase its risks.

In some cases inversion of the uterus may also take place. Because of lacerations and the impossibility of making adequate antiseptic preparations for delivery, puerperal sepsis is more likely to develop.

Foetal complications also arise. The rapidity with which the foetus is expelled may cause trauma with intracranial hæmorrhage and possibly asphyxia. Occasionally, the foetus may be expelled when the patient is in a standing posture and thus sustain serious injuries, or the cord may snap and hæmorrhage take place before assistance is available.

Prognosis—Maternal. The risks are greater in view of the complications, such as tears of the cervix, vagina and perineum; postpartum hæmorrhage and acute inversion of the uterus.

Foetal. The outlook is not so good on account of the trauma, the increased shock and the possibilities of laceration of the cord.

Treatment. The condition is hardly ever recognised until it has occurred. In cases with a previous history precautions might be taken to see that the patient is placed in bed and assistance is available as soon as the first signs of labour appear. In such cases it may be desirable to give an anæsthetic to prevent the strong

uterine contractions beginning at too early a stage. After delivery the patient is carefully examined for any tears, which if present are sutured with due antiseptic precautions.

The third stage of labour must be carefully watched.

Tonic Contraction of the Uterus

In this condition the uterus is in a state of continuous contraction, so that there is no relaxation and no rhythmic action of the uterine musculature. The condition generally develops in those cases where there is some insuperable obstruction to delivery. The upper uterine segment begins to contract and retract, pushing the foetus down, while the lower uterine segment expands and dilates thus accommodating a portion of the foetus as it is being forced down. In the normal course of events, long before the lower uterine segment stretches to any dangerous extent, the foetus passes through the pelvic canal and is born. But should an obstruction arise in the birth canal the increasing contractions of the upper uterine segment fail to expel the foetus, and in such cases the uterus may pass into a stage of tonic contraction, which later leads to uterine exhaustion or rupture of the uterus. With each contraction the upper and lower segments of the uterus become more markedly differentiated due to the retraction of the muscular fibres of the upper uterine segment and the stretching of the muscular fibres of the lower uterine segment. The muscular wall of the upper uterine segment thus becomes thicker and thicker, while the muscular wall of the lower segment become thinner and thinner. The demarcation between the upper and lower uterine segments becomes very prominent and a well-defined ridge, known as a *retraction ring*, or *Bandl's ring*, may be made out by abdominal palpation.

From what has been stated above, it is obvious that the differentiation between the upper uterine segment and the lower uterine segment is a physiological phenomenon which occurs in the course of every labour. If labour is normal the thinning out of the lower uterine segment is strictly limited and therefore the differentiation between the thickened upper uterine segment and the thinned-out lower segment is not sufficiently marked to be felt clinically as a distinct ring or ridge by abdominal palpation. In obstructed labour this physiological ring becomes much more marked and assumes a pathological significance. The height at which the ring is felt is an additional indication of the extent to which the obstruction has caused thinning and dilatation of the lower uterine segment. The presence of a ring high up deno

danger, for if help is not available and the uterine contractions persist, the limit of expansibility and thinning of the lower uterine segment will be reached and rupture of the uterus will take place.

Another point to be noted in such cases is the thickening of the round ligaments which stand out as tense cords on either side. They contract and retract in a manner similar to the upper uterine segment, and therefore become markedly exaggerated in thickness when the upper uterine segment is in a state of tonic contraction.

Ætiology. The causes of tonic contraction are obvious. In the majority of cases it occurs in obstructed labour, the uterus acting strongly in an attempt to overcome the obstruction, which may be due to faults in the passages or the passenger.

Administration of certain ecboic drugs, such as ergot or occasionally pituitary extract, if given in unsuitable doses or without proper indications, may produce tonic contraction.

Signs and Symptoms—General. The following general signs and symptoms will be noticed. The mother has an anxious expression, is restless, complains of severe and continuous abdominal pain; the pulse is rapid; temperature elevated, tongue dry; sordes may collect round the lips and gums, and cold clammy sweats break out. Occasionally nausea and vomiting may also be present.

Local Signs. These are referable to the uterus and vagina. On abdominal palpation the abdomen will be found to be tender, the uterus is very hard, the round ligaments prominent; a definite ring, Bandl's ring or the retraction ring may be present, running obliquely or transversely across the uterus, showing the differentiation into lower and upper uterine segments. Because of the tense uterus the foetal parts cannot be defined. The foetal heart sounds cannot be heard distinctly on auscultation; indeed they are frequently absent, as the child is dead.

On vaginal examination the vagina is found to be dry and warm; the presenting part may be jammed in some portion of the pelvic canal; a large caput succedaneum may be present, obscuring landmarks on the presenting part, the cervix is cedematous and there may be cedema of the vagina and perineum.

Clinical Course. When the uterus is in a state of tonic contraction, if delivery is not completed early, it may pass on to: (a) secondary uterine inertia or exhaustion; (b) rupture of the uterus.

The possibilities of rupture are imminent and it involves certain death of the foetus and grave risks to the mother.

In cases of secondary uterine inertia the uterus may regain its tonus after a period of rest, and then expel the foetus. In some cases the foetus dies and is retained, and intrapartum infection develops.

Other incidental risks are that the continued and prolonged pressure of the presenting part on the birth canal may lead to necrosis, followed later by sloughing and fistula formation. There is a greater risk of septic complications and the possibility of deep tears of the vagina and perineum in the subsequent course of delivery owing to the sodden condition of the soft parts.

Diagnosis. The general condition of the patient, the abdominal tenderness, the hard contracted uterus with the prominent round ligaments, presence of Bandl's ring and the vaginal signs enumerated above, complete a picture which ordinarily enables one to diagnose it with ease.

The only other condition with which an unfortunate mistake may be made is uterine exhaustion. The differential diagnosis between these two conditions is dealt with later.

Prognosis—Maternal. Tonic contraction is undoubtedly attended with grave risks to the mother; if not treated promptly it may lead to rupture of the uterus. Even where treatment is available the exhaustion, the possibilities of postpartum hæmorrhage that may supervene later, and the chances of infection all add considerably to the risks.

Fœtal. The fœtal prognosis is very grave. In a very large number of cases the fœtus dies due to direct compression exerted by the uterus as the liquor amnii has all drained away.

Treatment—Prophylaxis. This consists in a careful examination of the case both antenatally and early in labour, correcting any malpresentations or malpositions, and treating the case with due regard to such factors as are likely to cause obstruction during the course of delivery. Never give ergot or other oxytocic in the course of labour before the fœtus has been expelled. Pituitary extract ought to be given with great care. The indications and contraindications for the use of this drug are dealt with separately.

Curative. When a case of tonic contraction of the uterus is met with the patient should be given a dose of morphia ($\frac{1}{4}$ grain) and put under chloroform anæsthesia, while everything is prepared for immediate delivery. No intra-uterine manipulation such as version should be attempted, unless one is satisfied that under the influence of a general anæsthetic a certain amount of relaxation of the uterus is possible which will warrant such interference. Immediate steps should be taken to deliver the fœtus in the most conservative manner, particularly in view of the fact that in the majority of cases the fœtus is already dead. Craniotomy, decapitation, spondylotomy, embryotomy are some of the measures that may be needed to deliver the dead fœtus, depending of course upon presentation and position.

**Uterine Inertia; Sluggish Uterus; Weak Pains,
or Primary Uterine Inertia —**

In this condition the uterine contractions are weak, few and far between from the onset of labour, and occasionally may even cease altogether after a time. The force of uterine contractions varies in different individuals and is generally greater in the young than in the relatively old and in primiparæ than in multiparæ, but in ordinary circumstances is sufficiently strong to effect spontaneous delivery.

Causes. May be divided into general and local.

General causes pertaining to the mother :—

- (1) Poor general health due to lack of proper nutrition.
- (2) Chronic wasting diseases.
- (3) In some types of neurotic women the pains may be weak from the very beginning; possibly an endocrine factor is associated with this condition.

Local. May be attributable to :—

- (1) The uterus.
- (2) Faults in the passenger.
- (3) Faults in the passages.

(1) *Uterine Causes* :—

- (a) Overdistension of the uterus as in hydramnios, twin pregnancy or abnormally large children and monsters.
- (b) Abnormal positions of the uterus such as anteversion with a pendulous abdomen.
- (c) Developmental abnormalities such as an infantile type of uterus.
- (d) Tumours of the uterus, as fibroids.
- (e) Previous abdominal operations producing adhesions which interfere with the muscular activity of the uterus.

(2) *Faults in the Passenger* :—

Abnormal presentations and positions of the foetus such as breech, shoulder, face, brow, occipito-posterior.

Conditions due to twin pregnancy, abnormally large child and monsters producing overdistension of the uterus and thus causing primary uterine inertia have been referred to above

(3) *Faults in the Passages* :—

- (a) Contracted pelvis.
- (b) Full bladder and rectum.
- (c) Tumours of the adnexa in the pelvis such as dermoid cysts of the ovary.

A full bladder and rectum prevent the proper course of labour by causing reflex nervous inhibition.

Clinical Features. The inertia is generally more marked in the first stage of labour than in the second stage ; but in some cases it may occur in the second stage as well for quite a prolonged period. The short infrequent pains may, however, cause a certain amount of exhaustion to the mother, because in such cases they are teasing and ineffective. The exhaustion is also due to the want of rest and lack of proper sleep, but does not usually affect the general condition of the patient. In cases of primary uterine inertia there is little or no progress, although the woman has been in labour for several hours. Cervical dilatation is slow or stationary, and after the membranes have ruptured a caput succedaneum does not form. Ordinarily there is no danger to the child and the maternal pulse is not increased or the temperature elevated.

Diagnosis is comparatively easy. The weak nature of the pains, the ineffective contractions and the slow progress of labour, together with the absence of any signs of exhaustion as manifested by a rise of temperature or increased pulse-rate, will enable one to diagnose the condition of primary uterine inertia. The pains have little or no effect on the foetal heart.

The only condition with which it may have to be differentiated is an exhausted uterus, or the condition known as secondary uterine inertia, the differential diagnosis between which is dealt with later.

Prognosis. The outlook depends on the cause. The maternal prognosis is worse because of the greater risks of sepsis due to the frequent internal examinations that may have to be made and the manipulations necessary for completing the delivery.

Foetal prognosis is also worse as prolongation of the stages of labour has an adverse effect in increasing the chances of intracranial stress and asphyxia.

Treatment.—*Prophylaxis.* To avoid the possibility of primary uterine inertia antenatal care is of great use, and should in a large number of cases prevent the incidence of this complication. Such care will help in gaining the patient's confidence before labour begins.

General measures should be adopted during pregnancy to increase the strength of the patient, to improve the blood picture, and if possible, the tone of the uterus. Such pathological factors as may lead to this condition should also be corrected antenatally.

Curative—First Stage. It is generally believed that no harm results either to the mother or to the foetus so long as the membranes are intact, whatever be the duration of labour in a case of primary uterine inertia. While subscribing to this view in the majority of cases our experience leads us to state that in a few the foetus may be endangered even before the rupture of the membranes. We have noted, particularly in primiparæ, that the continuous pressure on the head as it lies in the pelvic cavity increases the congestion of the intracranial vessels and so the risk of cerebral hæmorrhage; sudden variation of the foetal heart-rate is noted in these cases. We are therefore not quite so emphatic that no harm can result to the foetus so long as the membranes are intact.

In the first stage, sedatives such as bromide and chloral or morphia $\frac{1}{4}$ gr. should be given to promote rest and sleep. At the same time the general strength of the patient must be maintained by glucose and light nutritious drinks. The bladder and rectum must be emptied. The patient must be re-assured and her confidence gained. In the majority of cases, after a sleep, labour pains start with greater vigour and generally delivery ends spontaneously.

Second Stage. During this stage it is not necessary to be unduly alarmed at the delay, and no useful purpose will be served by counting the number of hours after rupture of the membranes in deciding if interference is necessary. In many cases an attitude of watchful expectancy will be rewarded by a successful termination of labour and save both the mother and the child. We have left such cases alone in the absence of pains occasionally for twenty-four hours or even longer. Two things must, however, be carefully observed: (1) The condition of the foetus by frequent careful auscultation of the foetal heart; and (2) the avoidance of repeated vaginal examinations as far as possible. Where any variations of the foetal heart are noted, it is necessary to make a vaginal examination and note the presence or otherwise of a caput. We hold that a large caput is a more important indication for interference than slight variations in the foetal heart, and the absence of a caput points to there being no immediate necessity for interference.

If the cervix has not dilated sufficiently, a chloral and bromide draught is beneficial in helping the cervix to relax, and hot vaginal

douches sometimes favour the dilatation. When the cervix has sufficiently dilated and the greatest diameter of the head has passed through the brim of the pelvis, if labour drags on because uterine contractions are not sufficiently strong, the uterine muscle must be stimulated. Small doses of pituitary extract, $\frac{1}{8}$ to $\frac{1}{4}$ c.c., and not more, may be given. When the uterus has begun to contract, if the pituitary extract does not complete the delivery, artificial assistance in the shape of forceps for cephalic presentations or extraction in breech cases may be needed. In the majority of cases the use of pituitary extract will save the necessity for artificial interference.

If the delivery is effected with the precautions stated above, the third stage of labour need not give rise to any anxiety.

In primary uterine inertia, as opposed to uterine exhaustion, the power of retraction is not lost to the uterine muscle, and therefore postpartum hæmorrhage is not a complication generally met with. If, however, without attempting to stimulate it at first, delivery is hurried when the uterus is in a condition of inertia, postpartum hæmorrhage is likely to ensue.

Secondary Uterine Inertia or Uterine Exhaustion

As the term signifies, this condition develops after the uterus has been contracting normally for some time. It is generally the result of delay in labour due to some obstruction to the progress of the foetus. The uterine contractions start therefore in a normal manner and continue to recur with increasing intensity and frequency. Owing to obstruction or other causes, labour does not progress and the uterus becomes exhausted, with the result that the pains gradually weaken and finally cease.

Ætiology. (1) Factors concerned with obstruction to labour :—

- (a) Obstruction due to contraction of the bony pelvis or of the maternal soft parts such as rigid cervix, tumours about the brim of the pelvis, rigid perineum, etc.
- (b) Abnormalities of the foetus as regards presentation, position, size and deformities.

(2) Factors in relation to the uterus, such as :—

- (a) Weak uterine musculature as from multiparity.
- (b) Overdistension of uterus from hydramnios or antepartum hæmorrhage.

(3) Lack of or inefficient contractions of the accessory muscles of labour, that is, the abdominal and other voluntary muscles

Symptoms. The chief point to remember is that labour starts as in a normal case and the uterus begins to contract with increased frequency and force, but there is no advance of the foetus and finally the pains gradually become more and more feeble and die away.

Secondary uterine inertia generally occurs in the second stage of labour.

Differential Diagnosis. Secondary uterine inertia should be differentiated from primary uterine inertia on the one hand and tonic contraction of the uterus on the other. It is important to differentiate between the three conditions, as the treatment to be adopted is quite different in each of them and any mistake will lead to serious consequences for the mother.

(A)

	<i>Primary Uterine Inertia or Weak Pains.</i>	<i>Secondary Uterine Inertia or Uterine Exhaustion</i>
1. General condition of patient	Fair; no marked exhaustion.	Signs of marked exhaustion, elevation of temperature and pulse rate may be present.
2. Stage of labour.	Starts in the first stage.	Generally occurs in the second stage, after rupture of membranes.
3. Uterine contractions.	Weak from the onset of labour.	Contractions start in the usual manner, but become weak later and finally subside.
4. Foetus,	Condition of foetus not generally affected.	Foetal heart-rate may vary and indicate foetal distress; a large caput may be present.
5. Signs of prolonged labour.	No signs of prolonged labour, such as retraction ring or prominent round ligaments.	Signs of prolonged labour may be present, such as retraction ring, prominent round ligaments and a dilated lower uterine segment.

(B)

	<i>Secondary Uterine Inertia.</i>	<i>Tonic Contraction of the Uterus.</i>
1. General condition of patient.	Patient is fairly quiet but signs of exhaustion are present.	Patient is restless, anxious and complains of severe pain.
2. Pulse, respiration and temperature.	Pulse and temperature raised, but not very much; respirations may be normal.	Pulse rapid, respiration hurried temperature raised.
3. Abdominal palpation.	Abdomen not tender, uterus may be relaxed and the foetal parts may be easily palpable.	Abdomen very tender, uterus hard, foetal parts cannot be distinctly made out; Bandl's ring may be very obvious and round ligaments prominent.
4. Foetal heart.	Can be heard easily.	May not be heard on auscultation, even when the foetus is alive.
5. Vaginal examination.	Findings may vary, depending on what degree of severe contraction of uterus have been present prior to the onset of inertia.	Vagina is generally warm and dry, oedematous; large caput present; presenting part jammed at some level in the pelvis.

Prognosis. This depends on the ætiological factors concerned. It is serious for the mother, owing to the increased necessity for interference, the chances of postpartum hæmorrhage and the possible risks of infection.

Foetal prognosis is also grave; more so if factors such as contracted pelvis or malpresentations are responsible for the obstruction to labour.

Treatment. In the treatment of this condition it should be borne in mind that one is dealing with an exhausted uterus, and following the general principles of treatment for all kinds of exhaustion it is necessary to give it sufficient rest in order that it may recoup its power. Any attempt to stimulate the uterus at this stage will lead to disastrous results. Such overstimulation may temporarily force the uterus to contract and delivery may be effected with assistance; but as soon as the child is born the uterine exhaustion will assert itself to an even greater degree and result in a very severe form of atonic postpartum hæmorrhage.

The main consideration, therefore, in the treatment of secondary uterine inertia is to give rest to the tired uterus. This may be done

by administering sedatives, such as chloral and bromide, morphia, tincture opii or scopolamine. It is well to empty the bladder and rectum and ascertain definitely what factors are causing the obstruction. The patient will generally sleep for some time, and when she wakes up rested the possibilities are that the pains will reappear and be satisfactory. General stimulants such as glucose may be administered. When the pains have returned, but not till then, should any attempt be made to deliver the foetus. In some cases where the pains have returned but are not effective, a small dose of pituitary extract alone, or combined with thymus extract, may help, provided there is no obstruction and the greatest diameter of the head has already passed through the brim of the pelvis. In cases where signs of foetal distress manifest themselves, labour may be terminated by the application of forceps, or such other method of assisted delivery as may be indicated.

The management of the third stage of labour should be done with care, and it is wise to be prepared for the possibility of post-partum hæmorrhage.

IRREGULAR CONTRACTIONS OF THE UTERUS

Contraction Ring and Hour-glass Spasm—Definition. By the term "contraction ring" is meant a definitely localised area of tetanic contraction confined to a segment of circular muscle fibres in the uterus. It may form at any part of the uterus and in any stage of labour. When this ring forms in the third stage of labour we speak of it as an "hour-glass spasm" or contraction.

It is important to differentiate between the contraction ring and the retraction ring or Bandl's ring. It has already been stated that the retraction ring begins as a physiological phenomenon, inasmuch as it is merely the demarcation between the upper and lower uterine segments and becomes more prominent in the second stage of labour. Its pathological significance only develops when it becomes clinically obvious on abdominal palpation and at a high level above the symphysis pubis. A retraction ring, therefore, forms in the second stage of labour. A contraction ring, on the other hand, is not physiological and may occur in the first or second or third stage of labour. It is not necessarily associated with any obstruction of labour. The contraction may be around a part, often a small part, of the foetus such as the neck or the breech, or occasionally a limb; or it may be entirely dissociated from any portion of the foetus and occur below the level of the foetus altogether.

Causes. The causes of contraction ring formation are not clear. It is probably due to some nervous factor which causes an abnormal

irritability of the uterine musculature. Some of the predisposing factors are:—

- (1) Premature rupture of the membranes.
- (2) Malpresentations or abnormal lies, particularly oblique or transverse.
- (3) Intra-uterine manipulations.
- (4) The use of certain drugs such as ergot, and sometimes pituitary extract before delivery.

Symptoms. Very few symptoms manifest themselves; in fact the general condition of the patient does not indicate that a contraction ring has formed; nor can the ring be recognised by abdominal palpation. It is only on making a thorough internal examination in cases of prolonged labour without any obvious cause or usually following an unsuccessful attempt at delivery, that the presence of a contraction ring is diagnosed.

Diagnosis. The only way to diagnose a contraction ring is to feel it by vaginal or intra-uterine examination.

The following points drawn up by Clifford-White will be found useful when making a differential diagnosis between a contraction ring and a retraction ring.

CONTRACTION RING.

Local girdle of thickening which may be found at any site in the uterine wall.

Uterine wall is thicker at the ring than above or below.

The wall of the lower uterine segment is neither thinned-out unduly nor distended.

Presenting part is not forced down into the pelvic girdle and jammed. Child may be completely above a contraction ring.

Uterus is relaxed between the pains.

It may form at any stage of labour and does not change its position.

It is never felt by abdominal palpation.

The patient does not present any disturbing general signs of distress.

Caused by premature rupture of the membranes and intra-uterine manipulations.

RETRACTION RING.

Junction of thinned-out lower uterine segment and thick contracted upper uterine segment.

The wall is thicker above and thinner below.

The wall of the lower uterine segment is thinned and distended.

Presenting part is wedged in the pelvic girdle.

Child will never be completely above a retraction ring.

The whole uterus is tender and retracted and no relaxation occurs.

Formed late in obstructed labour and rises to a higher level above the symphysis pubis.

Is always palpable when pathological unless it only develops posteriorly.

The general condition of the patient is obviously serious.

Is produced in the course of treated obstructed labour.

Prognosis. Once a contraction ring has formed it shows no tendency to relax, and it presents one of the most difficult problems in obstetrics.

The maternal prognosis is serious as the condition causes severe dystocia and delivery presents unusual difficulties.

The foetal prognosis is very bad. Over 80 per cent. of the children die.

Treatment. As a contraction ring is a localised spasm of the uterus, it has been suggested that anti-spasmodics might produce relaxation. The drugs recommended and used are amyl-nitrite in capsules and epinephrin. Deep chloroform anaesthesia in combination with morphia may be tried but is not always successful.

If relaxation does not occur, steady continuous traction on the presenting part does, in some cases, help to promote relaxation and facilitate delivery. In cases of vertex presentation, Willett's forceps may be fixed to the scalp and traction applied by a weight acting over a pulley as in cases of placenta praevia.

If the foetus is dead, a cranioclast may be applied to the head and continuous traction by a weight then exerted. In cases of breech presentation, a similar method of treatment may be adopted by applying traction to a foot after it has been brought down to the vulvar orifice.

If, however, such methods fail, or where the lie is an oblique one, the only treatment is Caesarean section. Version should never be attempted in such cases, as the contraction ring makes it impossible to change the position of the foetus, and if undue force is exerted the uterus will be ruptured. Where infection is suspected, especially in cases where the patient has been subjected to repeated attempts at vaginal delivery, it is wise to do a Caesarean hysterectomy.

The phenomenon of *hour-glass contraction* which occurs in the third stage of labour is described in the chapter on postpartum haemorrhage.

MISSED LABOUR

This is a rare condition where labour starts at the expected time at full term, but instead of continuing normally comes to an abrupt end and the foetus dies. The foetus may be retained in the uterus for a variable period. The condition is analogous to that of missed abortion, where in the early weeks of pregnancy the ovum dies and is retained in the uterus, sometimes for days, sometimes for weeks and even months.

Causes are not definitely known. It is probable that it may be associated with some disturbance of the endocrine system or of the sympathetic nervous system or both.

Diagnosis. The size of the uterus and the height of the fundus should be noted. In cases of missed labour the height of the uterus will be stationary and in some cases it may even be less than at full term. The foetal heart is not audible, and if one finds that there is no enlargement of the uterus after observing it from two to four weeks, missed labour should be suspected.

The only condition with which it may sometimes be mistaken is an abdominal pregnancy with death of the foetus. In this condition, however, the foetal parts can be felt more easily on abdominal palpation and occasionally the uterus may be palpated as a distinct mass from the foetal sac. The history if carefully gone into may also be significant, as symptoms referable to ruptured ectopic pregnancy in the early weeks of gestation may be elicited. A radiographic examination may sometimes be of help in the differential diagnosis of the two conditions.

In the absence of facilities for a radiograph a sound may be passed into the uterine cavity and the length of the cavity will decide the nature of the enlargement, whether it is intra- or extra-uterine. There need be no hesitation in attempting to pass a sound in such cases, occasionally it not only helps to diagnose the condition but also facilitates the treatment, namely, the induction of labour in such cases.

Occasionally pregnancy may be prolonged beyond the fortieth week. The foetus continues to grow in the uterus; but this condition need not be confused with that of missed labour. If the foetal heart is audible the diagnosis is obvious that it is one of prolonged gestation and not of missed labour.

Treatment. Where a definite diagnosis of missed labour has been made it is necessary to induce labour. The methods of induction of labour will be dealt with elsewhere.

Medicinal methods of induction of labour or rupture of the membranes by passing a sound may be adopted. The actual delivery of the foetus should be done by conservative methods as far as the mother is concerned, inasmuch as the foetus is already dead and occasionally macerated. Accordingly, perforation and other forms of embryotomy may be undertaken so as to save laceration of maternal soft parts.

Where the foetus is dead and septic infection is suspected two methods are open. In some cases it may be desirable to deal with it by the abdominal route and perform a hysterectomy at the same time. The other alternative is to do a vaginal Caesarean section, deliver the foetus and drain the uterine cavity.

CHAPTER XXXIII

DYSTOCIA DUE TO ABNORMALITIES OR ANOMALIES
OF THE MATERNAL SOFT PARTS

LABOUR may sometimes be delayed or rendered difficult on account of obstruction to the passage of the foetus by the maternal soft parts. These difficulties may be due to abnormalities of:—

- | | |
|-----------------|-----------------|
| (1) The vulva. | (2) The vagina. |
| (3) The cervix. | (4) The uterus. |

In discussing these conditions it is assumed that the bony pelvis is normal and that the dystocia is due to maternal soft parts only. It is obvious that sometimes more than one factor may be involved in the causation of difficult labour and that both the soft parts and the bony pelvis may be at fault. It is necessary, therefore, to examine both the bony pelvis and the soft passages in every pregnant woman to detect any abnormalities that may lead to dystocia.

1. Abnormalities of the Vulvar Outlet

There are several conditions of the vulvar outlet which may lead to dystocia.

(1) **Atresia of the Vulva.** Generally incomplete, this is often accompanied by imperfect development of the sexual organs. If pregnancy occurs in such a case the second stage of labour is naturally prolonged and may necessitate an episiotomy to avoid extensive perineal tears which may involve the rectum.

(2) **Rigid Perineum.** This condition is often met with in elderly primiparæ and also in multiparæ who have had previous perineal lacerations repaired. In the latter a keloid condition may develop, increasing the rigidity of the perineum.

The treatment consists in performing episiotomy.

(3) **Œdema of the Vulva.** There are many conditions which may cause cedema of the vulva in a pregnant woman or in a woman during labour. In pregnancy it is generally due to toxæmia, renal or cardiac diseases, or anæmia. In such cases it will be noticed that the cedema is present not only in the perineal region but also in the labia majora and minora, and is generally bilateral. Œdema of other parts, such as the extremities or the face, may also be present. Such a type of cedema does not cause obstruction to delivery. If the cedema is marked and causing considerable distress it can be treated either in pregnancy or labour by multiple punctures with a needle and the application of hot compresses. During

the course of delivery lacerations are liable to occur, and these heal badly. In the presence of œdema it is not desirable to suture such tears, as occasionally the parts slough and cause septic complications.

There is another type of œdema that occurs in prolonged labour caused by the pressure of the head in the pelvic cavity causing obstruction to the circulation of venous blood. This œdema mainly involves the perineum and only to a much less extent the lower part of the labia on either side. It is not associated with œdema in any other part of the body and must be distinguished from that which results from the conditions referred to above. It is a valuable sign of prolonged labour and indicates the necessity for a careful investigation of the cause of the delay. Instrumental aid is often necessary in such cases. Tears of the perineum in such cases should not be sutured, so that the drainage is free. During the puerperium it may be desirable to treat these lacerations with hot fomentations and dress them with suitable antiseptics such as mercurchrome, etc. When the œdema has subsided and the parts are clean, secondary suture of the perineum may be done.

(4) **Inflammatory, Malignant and other Lesions.** These are comparatively rare, but there are two conditions not infrequently met with in the tropics which it is desirable to take note of:—

(a) *Elephantoid Growth of the Vulva.* This may sometimes lead to severe dystocia. In one case the dystocia was so great that it ended in rupture of the uterus before the woman was brought to the hospital. The head was low down on the perineum, but the vulvar outlet was very narrow and barely admitted two fingers, due to the rigidity caused by the elephantoid growth of the perineum. In such conditions it is better, provided the diagnosis is made sufficiently early, to perform a Cæsarean section and deliver the foetus. If, however, the woman is only seen late in labour, bilateral episiotomy is carried out before delivery is effected; considerable difficulty is experienced in the healing of the incised wounds in the puerperium. Suturing of such tears serves no useful purpose and is better avoided.

(b) *Healed Scars of Infective Granulomata.* These healed scars produce such a severe form of cicatrization that the vulvar outlet becomes considerably narrowed and admits only one finger. In such cases we prefer to perform a Cæsarean section as soon as labour begins.

(5) **Hæmatoma of the Vulva.** This is a very rare condition met with in the second stage of labour. Because of the pressure of the head and the engorgement of the veins, one of the veins gives way and the blood is extravasated into the soft loose areolar

tissue of the labium, producing a large hæmatoma which impedes the further progress of the head.

The patient experiences intense pain which is sometimes of a tearing nature and a large extravasation of blood burrowing into the loose tissues round about the vulva may cause signs and symptoms of internal hæmorrhage.

The usual treatment in a case of vulvar or vaginal hæmatoma is to place the patient at absolute rest in bed. If the course of labour is interfered with on account of the hæmatoma, it is not wise to allow the child to be born without first dealing with the hæmatoma. Particular care should be taken not to drag the child past the "tumour" by applying forceps. With due antiseptic precautions an incision is made into the sac, the coagulated blood is cleared out, any bleeding points are caught and ligatured and the cavity packed with gauze. Thereafter the child is delivered if necessary with artificial assistance.

Should the hæmatoma develop after delivery the treatment adopted depends upon the size of the hæmatoma. Where it is a large open sac, clear out the clots and pack; if small it may be left to absorb spontaneously. Should suppuration develop it is incised and free drainage established.

Cysts of the Vulva. These are usually Bartholin's cysts and rarely obstruct labour. In some cases the cyst suppurates and thus becomes converted into an abscess. It is not desirable to open the abscess till some days after the delivery; but where the abscess wall is tense and is likely to burst in the course of delivery, it is better to aspirate and draw off the thin purulent material and seal the opening before allowing delivery to take place. If the purulent material is thick and aspiration is not possible the abscess should be opened, after taking precautions to see that the vagina is protected, so that none of the purulent material escapes into it. After opening the cavity and draining, the interior should be touched with some strong antiseptic such as pure carbolic acid, swabbed with spirit to limit the action of the carbolic, and then plugged. Great care is necessary during the puerperium when attending to the abscess-cavity and swabbing the perineum.

2. Abnormalities of the Vagina

DEVELOPMENTAL ANOMALIES

Incomplete Atresia of the vagina is generally associated with sterility. In cases where pregnancy results the atresia may be so pronounced that vaginal modes of delivery may be out of question. Such cases require a Cæsarean section.

A Double Vagina or a Septate Vagina. In cases of double vagina, if the septum is complete and involves the cervical canal and the uterus, labour is not generally interfered with, as one portion of the vagina dilates while the other is compressed by the passage of the foetus. When, however, the septum is incomplete it may form a definite band in front of the presenting part and thus cause obstruction. It is necessary in such cases to incise the septum and make the vagina one common canal.

Acquired Atresia. This is secondary to inflammatory lesions or traumatic causes generally following labour. In some cases the atresia may be so pronounced and the scarring of the vaginal tissues so great that there is no possibility of effecting any dilatation of the vaginal canal. In others again the adhesions may be comparatively mild and readily yield to manual or hydrostatic dilatation. Where thick scars are present which do not yield to dilatation or incision, Cæsarean section is necessary.

Occasionally the vagina may be encroached upon by tumours in the rectum, as for example syphilitic gummata, malignant tumours of the rectum, or adenomata. In such cases, the treatment will depend upon the degree of resulting obstruction. We have met with one case where a gummatus infiltration about the rectum was so pronounced as practically to occlude the whole vaginal canal and necessitate a Cæsarean section.

Vaginal Neoplasms. These may be cystic or solid and are comparatively rare; in cases where it is possible to excise the tumour this should be attempted before delivery is effected. If the tumour, however, is small and not likely to cause any obstruction labour may be allowed to proceed. The treatment of malignant tumours of the vagina is considered separately in the chapter on tumours complicating pregnancy.

3. Abnormalities of the Cervix

Rigidity of the cervix is one of the causes of delay in labour. Such rigidity may be due to:—

- (1) Organic causes, or
- (2) Functional causes.

ORGANIC RIGIDITY OF THE CERVIX

This may be due to the following causes:—

- (1) Inflammatory conditions of the cervix leading to cicatrization.
- (2) Trauma of the cervix, particularly following child-birth, leading to irregular cicatrix formation.

- (3) Operations on the cervix, such as amputation of cervix, which results in scarring.
- (4) New growths in the cervical canal.
- (5) As a result of irradiation.

In the majority of such cases the cervix dilates in a surprising manner, so that during labour the cervix that was considered hard and rigid reaches full dilatation fairly easily. Sometimes, however, the dilatation is delayed or does not occur and artificial aid may be necessary. Rigidity is greater in those cases which follow certain operative measures such as amputation of the cervix.

Treatment. Sufficient time should be given during labour for dilatation to occur, especially when the rigidity is due to scarring from previous inflammation. Where the cervix does not dilate and the necessity arises for immediate delivery, some method of artificial dilatation must be adopted. The available methods are:—

(1) *Manual Dilatation.* This consists in dilating the cervix with the fingers with due antiseptic precautions, the patient being preferably under an anæsthetic. At first the thumb and index fingers are introduced, later the middle finger and so on, till all five fingers can be passed and the cervix thus uniformly stretched and dilated. Care must be taken to see that the cervix is not forcibly stretched and that the operation is done slowly so as to permit of gradual and uniform dilatation.

Another method of manual dilatation that may be adopted is to introduce the index and middle fingers of either hand and gradually stretch laterally, antero-posteriorly and diagonally in opposite directions. The patient must be under anæsthesia before attempting either of the methods. Sometimes, associated with the organic rigidity, there is a certain amount of cervical spasm present as well.

Small tears are almost inevitable, but if the dilatation is properly performed in the slow and deliberate manner in which it ought to be done there should be no large tears.

After full dilatation the method of delivery depends upon the condition of the foetus and the relation of the presenting part to the pelvis. Where, after such manual manipulations, tears of the cervix result in the further course of delivery, such tears ought to be sutured immediately. It is a wise precaution to examine the cervix as a routine after delivery in such cases.

(2) *The Use of the Hydrostatic Dilator.* Metreurynters or hydrostatic dilators may sometimes be used in the dilatation of the cervix. The method of using such dilators is described in the chapter on placenta prævia.

(3) *Multiple Incisions of the Cervix.* This is a method popularised by Dührssen and can be adopted under certain circumstances. We prefer the manual method of dilatation wherever possible; but if the delivery is urgent, or if manual methods do not succeed, multiple incisions may be made. Care should be taken to see that the directions of the incisions are such that any extension will not lead to the involvement of the uterine vessels or the bladder. Multiple incisions are also employed to prevent any single tear from extending upwards to involve the lower uterine segment and cause a rupture which may open into the pelvic cellular tissue or the peritoneal cavity.

The general directions in which such incisions should be made are represented by the position of the hour-hand of a clock at 2, 6 and 10. Incisions of the cervix should generally be made only in cases where the cervical canal is almost effaced but the external os is small and not dilating properly. After delivery the cervical incisions should be carefully sutured to reduce the chance of sepsis and the scarring of the cervix.

We do not advocate dilatation of the cervix by any of the branched metallic dilators. We have never used these instruments in our practice and feel that they are fit only for the museum as relics of a bygone age. The use of such instruments is attended with a great deal of shock, irregular lacerations of the cervix and consequent hæmorrhage, and a much greater risk of puerperal sepsis.

(4) *Vaginal Hysterotomy.* Another method of treating organic rigidity of the cervix is by vaginal hysterotomy. If the difficulty is entirely confined to the soft parts and there is no cephalopelvic disproportion the operation will prove very satisfactory in selected cases.

In cases where the rigidity is extremely marked, as sometimes happens after amputation of the cervix, or in certain forms of congenital hypertrophic elongation of the cervix it may be advisable to perform an abdominal Cæsarean section.

FUNCTIONAL RIGIDITY OF THE CERVIX

This is generally noted in elderly primiparæ or neurotic women who dread the onset of labour. Occasionally it may be due to reflex irritation from an overdistended bladder or a loaded rectum. It is usually recognised in the early stages of dilatation when the cervix is only one or two fingers dilated and the membranes ruptured. It may sometimes occur where the presenting part, generally the cephalic pole, does not fit the lower uterine segment. It is not infrequent in cases of occipito-posterior positions with a minor degree of cephalopelvic disproportion associated with inertia.

Treatment. Factors responsible for reflex irritation should first be treated. The bladder should be emptied and the lower bowel cleared by means of enemata. The neurotic type of woman must be reassured, freed from the importunities of all anxious relatives and preferably given a sedative such as a chloral and bromide draught, or a dose of morphia or scopolamine. When the membranes have ruptured, hot douches are sometimes efficacious. The application of cocaine to the cervix occasionally acts well. A plug of gauze soaked in 5 to 20 per cent. solution of cocaine hydrochloride is inserted into the vagina. In some cases a plug soaked in sterilised glycerine may serve the same purpose, and it is particularly useful where a certain amount of organic rigidity is associated with functional rigidity.

As in cases of organic rigidity there should be no undue haste in artificially dilatating the cervix. In some cases where the uterine contractions themselves are feeble and occur at long intervals, the cervix may not dilate for twenty-four hours or over; in the absence of any signs or symptoms of distress, foetal or maternal, there is no necessity to interfere. Rest, sedatives and patience will pay in the majority of cases.

If after employing the methods just described, the cervix fails to dilate sufficiently, the artificial methods of dilatation used in the condition of organic rigidity may have to be employed, such as manual dilatation, metreuryxis or multiple incisions.

Endocrine therapy is being tested in these cases now, but it is too early to form any opinion.

Where the rigidity is extreme and the dilatation of the cervix is very poor, an abdominal Cæsarean section may have to be considered.

CEDEMA OF THE CERVIX

This condition may occur either during the course of pregnancy or during labour.

During pregnancy it may occur in cases of generalised oedema or sometimes it results from minor degrees of prolapse of the gravid uterus.

During labour oedema of the cervix generally involves the anterior lip. In the majority of cases, it is due to pressure by the presenting part, the head, on the anterior lip of the cervix before it has been completely taken up and dilated. A vicious circle results in such cases. With a partially dilated cervix, the head presenting and pressing upon the anterior lip interferes with the circulation, which results in oedema, and as it increases, it in turn causes further

obstruction to the course of delivery. In extreme cases of this condition the œdematous anterior lip may be seen at the vaginal outlet, while the head is jammed in the pelvic cavity. Occasionally œdema may be present in the posterior lip of the cervix as well; and rarely both lips of the cervix may be equally œdematous, completely covering the presenting part and obstructing its progress.

Treatment. In the majority of cases where only the anterior lip is involved it is possible by vaginal manipulation under anaesthesia to dilate the cervix sufficiently to push it above the presenting part. If the œdema is considerable the cervix may be painted with an antiseptic and the œdema relieved by puncturing with a sharp needle, after which the anterior lip is pushed up above the presenting part.

The same method of treatment should be followed in cases where the posterior lip or both lips are œdematous. Occasionally œdema may be only partially relieved and the cervix may have to be manually dilated before delivery can be effected.

Care must be taken in the puerperium to see that the parts are kept clean and mild antiseptics used to touch up any lacerations that may have occurred. Occasionally portion of the cervix may necrose and slough away or have to be separated during the puerperium.

MALPOSITIONS OF THE CERVIX

Sometimes the cervical canal, instead of being situated in the middle of the pelvic cavity, more or less on the curve of Carus, is displaced and deviated anteriorly, posteriorly or occasionally laterally. Generally this follows displacements of the body of the uterus, and is very rarely due to adhesions near the isthmus uteri. The cervix may be displaced anteriorly and the external os may be felt actually underneath the symphysis pubis in the condition known as posterior sacculation of the uterus. On the other hand, the external os may be in the hollow of the sacrum, or occasionally pointing towards the sacral promontory in cases where anterior sacculation has occurred. In some cases lateral deviations of the cervix may also result, so that the cervix is pointing to one or other side of the pelvic cavity.

In all these cases considerable difficulty is experienced in the process of dilatation and taking up of the cervical canal, when the longitudinal fibres of the uterus contract. Displacements of the presenting part also occur and the force of uterine contractions is directed towards a cupola formed either by the anterior or posterior sacculæ, so that much of the effect of the uterine contractions is

lost. In the majority of cases, where extreme degrees of displacement of the cervical canal are not present, it may be possible to pull the cervix down by means of a vulsellum and gradually dilate it manually. Given time, in most of these cases the obstruction is overcome and the cervix is taken up. Where nature does not succeed, incision of the cervix may be necessary. In the more severe cases abdominal route delivery may be necessary.

CHAPTER XXXIV

DYSTOCIA DUE TO ABNORMALITIES OR ANOMALIES
OF THE MATERNAL SOFT PARTS (*continued*)

4. Body of the Uterus

DYSTOCIA may result from any of the following causes:—

- (1) Malformations of the body of the uterus.
- (2) Displacements of the uterus.
- (3) Tumours of the uterus and its adnexa or neighbouring structures.

MALFORMATIONS OF THE UTERUS

These are caused for the most part by the persistence to a greater or less extent of the septa between the ducts of Müller. It may be recalled that the Fallopian tubes are formed from the upper portions of the Müllerian ducts to their point of fusion one with the other. From the inferior portions, the uterus and vagina are formed by absorption of the fused inner walls. If the absorption of the inner walls of the ducts does not take place the uterus and vagina are divided into two lateral halves; should, however, a partial union take place a corresponding degree of malformation results. There are many degrees of these deformities, depending upon the extent to which the fusion and subsequent absorption is deficient. Five degrees are generally described.

In the *first degree* there is a slight depression in the median line of the fundus resulting in the formation of a horse-shoe shaped uterus, spoken of as *uterus cordiformis*.

In the *second degree* the septum extends along the length of the body up to the internal os.

In the *third degree* the septum extends not only through the uterine body but also through the cervix.

In the *fourth degree* the septum runs down into the vagina but does not completely divide it.

In the *fifth degree* the septum divides the vagina completely, causing the condition spoken of as a double vagina.

It will be readily seen that varying degrees of persistence of the septum will produce corresponding degrees of malformation. In this bifid condition, as well as in cases of a fully formed double uterus, the two sides may be equal or unequal.

Depending upon the degree of malformation the following conditions are met with:—

(1) **Uterus Didelphys.** Here there are two separate uterine cavities each communicating with its own cervical and vaginal canal. The two Müllerian tubes have failed to fuse in their lower two-thirds. Each uterine body can therefore be palpated separately.

(2) **Uterus Bicornis Bicolis.** This differs from the preceding one, in that the body of the uterus appears to be made up of one cavity; but there is a slight depression at the fundus, and the septum leading from this depression passes right through the cervical canal and vagina, thus separating the two halves completely.

(3) **Uterus Bicornis Unicollis.** Here there is one cervical and vaginal canal, but there is a depression at the fundus with a partial septum which lies in the upper half of the uterine cavity.

(4) **Uterus Septus.** The uterus presents the normal shape externally with no depression at the fundus, but a membranous septum stretches right up to the external os, dividing the body of the uterus and cervical canal into two halves. The vagina is single.

(5) **Uterus Subseptus.** This condition is different from the preceding one (4) in that the septum does not extend to the whole length of the uterine cavity, being confined to the upper portion for a variable distance.

(6) **Uterus Unicornis.** Here the main body and cervix of the uterus have been developed from one Müllerian duct and there is a rudimentary horn to one side of it, the cavity of which usually fails to communicate with either the developed horn or the vagina.

Occasionally the uterus itself may be a rudimentary organ or it may be infantile and very much under-developed, or again, in some cases, its development though not complete is still further advanced, so that it presents the appearance of an adolescent uterus in adulthood.

Rarer still there may be a complete absence of the uterus in some cases. In the two last conditions pregnancy does not occur and no question of dystocia therefore arises.

PREGNANCY AND LABOUR IN UTERINE MALFORMATIONS

Pregnancy in uterine malformations, though rare, is sometimes met with. In most cases of uterine deformities the two portions

of the uterus are not symmetrical and equal. Pregnancy occurs usually in one half of the uterus and a false decidua may form in the other half. Not infrequently abortion occurs; in some cases premature labour is the result; occasionally pregnancy goes to term and may end normally.

The common complications met with are weak pains, postpartum hæmorrhage, adhesion of the placenta; malpresentations are not infrequent. Owing to poor development of the uterus in cases where labour is prolonged or obstructed the uterus may rupture. The placenta, if it is formed on the septum, may be adherent and may cause postpartum hæmorrhage.

Uterus Didelphys. In this condition, as there are two complete uteri, each with a distinct body and cervix, pregnancy may take a normal course. Occasionally delivery may be impeded by the septum in the vagina. In the early weeks of pregnancy the presence of the non-gravid uterus may give rise to the mistaken diagnosis of an extra-uterine gestation or an inflammatory complication of the adnexa. In some of these cases menstruation may occur throughout the course of pregnancy from the non-pregnant uterus.

Uterus Bicornis Bicolis. Pregnancy may occur in either half of the uterus, and when it occurs in one horn of a bicornate uterus the other undergoes some degree of hypertrophy and a decidua is formed in its cavity. Usually pregnancy takes a normal course and delivery is spontaneous. In rare instances the non-pregnant horn of the uterus may impede the progress of labour by obstructing the passage of the head in the pelvic cavity. It is difficult to make a positive diagnosis till the delivery is completed. The presence of a double vagina or a double cervix may possibly give a clue.

In the condition of *uterus bicornis unicollis* the difficulty in diagnosis is even greater, and some cases are not diagnosed till after delivery.

Uterus Septus and Subseptus. In these conditions pregnancy and parturition generally run a normal course. In some cases the placenta may be retained or adherent, and it is during the manual removal of the placenta that the condition is generally diagnosed. In a few cases the head or other part of the foetus may pass through the septum.

Labour does not appear to be impeded and generally, unless there are other causes, the lie is longitudinal.

In *uterus subseptus* the fundus of the uterus may be normal in outline or occasionally there may be a depression at the fundus. Abortion is relatively frequent, and sometimes considerable difficulty may be experienced in removing the placenta. Where a septum is present in the cervical canal, difficulties may sometimes arise

owing to a portion of the foetus slipping through the septum and so interfering with further progress.

Uterus Unicollis. Pregnancy is extremely rare in this type of uterine deformity.

Pregnancy in the rudimentary horn is attended with grave risks. This complication is dealt with in the chapter on extra-uterine gestation.

DISPLACEMENTS OF THE UTERUS

Not infrequently displacements of the uterus occur during the course of pregnancy. The following are some of the common forms of displacements that may occur:—

- (1) Backward displacements (retroversion, retroflexion, retroversio-flexion).
- (2) Forward displacements (anteflexion, anteversion).
- (3) Downward displacements (prolapse of the gravid uterus).

1. Backward Displacements.

Pregnancy may occur in a retroverted or retroflexed uterus, or a pregnant normally placed uterus may become displaced backwards. Of these two possibilities the former is much the commoner.

Causes. Backward displacements of the gravid uterus may be brought about in the early weeks of pregnancy by several factors, the more important of which are:—

(1) *Sudden Strain.* In those indulging in active athletics, the sudden strain involved may occasionally produce a backward displacement of the comparatively heavy uterus within the first twelve weeks of pregnancy.

(2) A *chronically overdistended bladder* likewise exerts pressure on the fundus of the growing uterus and predisposes to displacement backwards.

(3) In certain types of contracted pelvis, particularly the flat variety where the sacral promontory is prominent it effectively prevents the growth of the uterus upwards and produces a retro-displacement.

Causes of retroversion of the uterus occurring before the development of pregnancy may be due to:—

- (a) Congenital origin.
- (b) After a previous pregnancy retroversion may develop during the puerperium.
- (c) Tumours of the body of the uterus, particularly fibroids, may exert a pressure backwards and thus cause retroversion.

- (d) Old adhesions and increased intra-abdominal pressure may favour the condition.

Clinical Features. At first the condition gives rise to little discomfort. Sometimes, however, reflex symptoms such as hyperemesis may be marked and are occasionally immediately relieved if the displacement is recognised and corrected. As a rule it is generally after the twelfth week of pregnancy when the uterus is beginning to become incarcerated that symptoms appear.

Bladder symptoms are the commonest. Frequency of micturition followed by retention of urine may be the first symptom to make the patient seek advice. Constipation also occurs in a large number of cases and the patient may complain of backache or vague abdominal pain which may sometimes become very severe. In most cases spontaneous rectification occurs, that is, the condition corrects itself and the uterus becoming anteverted gradually grows towards the abdominal cavity, so that there is a relief of the symptoms described above. If such restitution does not occur the following terminations may result in their order of frequency:—

- (1) Abortion. (2) Incarceration. (3) Sacculation.

(1) *Abortion.* A retroverted gravid uterus has a marked tendency to abort. This is due to the displacement causing increased congestion, and irritability of the uterus. Because of the uterine position the abortion is frequently incomplete.

(2) *Incarceration.* The uterus may become incarcerated. When spontaneous rectification does not occur, the uterus increases in size in the pelvic cavity and eventually completely fills it and becomes wedged in it. This is called incarceration of the gravid uterus. This is more likely to occur if the pelvis is flattened and there is an abnormal projection of the sacral promontory under which the fundus becomes trapped.

After incarceration the uterus continues to develop in the pelvis. Sooner or later one of three terminations may occur:—

- (a) The uterus may empty itself.
(b) Sacculation of the uterus may occur and pregnancy proceed.

(c) The incarceration may become complete resulting in pressure upon the neighbouring structures, especially the urethra. Further growth of the uterus can only occur in an upward and forward direction. This carries the cervix higher. The anterior vaginal wall and the urethra in close relationship to it are stretched and the lumen of the urethra becomes further constricted. The bladder then becomes much distended as a result of retention of urine, the wall hypertrophies, becomes oedematous and may undergo

ecrosis. Following such damage to the bladder a severe septic infection, known as exfoliative cystitis, develops and may lead to pyelitis and pyelonephritis. Sloughs of bladder mucosa may be

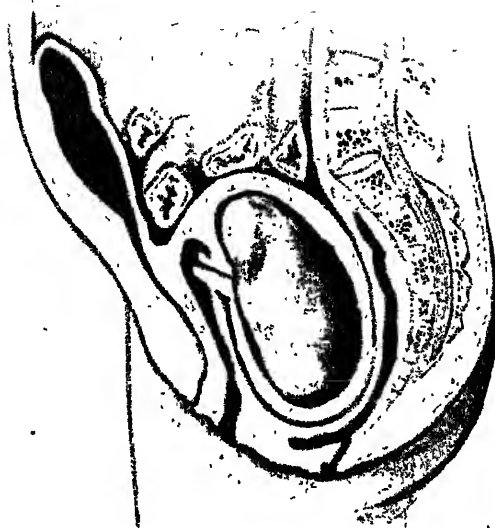


FIG. 137.—Retroverted gravid uterus: incarceration.

passed *per urethram*. Infection may spread through the bladder wall, or the bladder may rupture and cause pelvic peritonitis and later, general peritonitis. Occasionally the uterus may slough and even rupture of the uterus has been recorded.

A rare complication of this condition was noted in one of our cases. A loop of intestine became prolapsed behind the uterus and was strangulated. More than any other organ, the bladder is affected in cases of retrodisplacement of the uterus during pregnancy. Difficulty in urination is perhaps the first evidence of the displacement, and is so characteristic a symptom of this condition that dysuria should always arouse suspicion of a backward displacement. Bladder symptoms are generally in evidence earlier if retroversion is associated with retroflexion. The difficulty in urination is at first slight, but gradually increases till at last complete retention of urine occurs with or without paradoxical incontinence due to overflow.

Diagnosis. The diagnosis of a retroverted gravid uterus is not difficult. Whenever the patient complains of difficulty in micturition or retention of urine and backache in the early weeks.

pregnancy, a vaginal examination must be insisted on. A careful bimanual examination reveals the absence of the uterine body in front and its presence in Douglas' pouch posteriorly. The level of the cervix is raised and the external os points upwards and forwards towards the symphysis pubis. This affords a very useful indication as to the position of the body of the uterus.

After the twelfth week it may be possible to feel the intermittent contractions of the body of the uterus situated in Douglas' pouch. The associated signs and symptoms of pregnancy, such as amenorrhœa, morning sickness, changes in the breasts, enlargement of the body of the uterus and softening of the cervix may be noted.

Differential Diagnosis. The condition of retroverted gravid uterus has to be distinguished from:—

- (1) Extra-uterine gestation with pelvic hæmatocele.
- (2) Tumours of the ovary, particularly cysts.
- (3) A fibroid in the posterior wall of the uterus.

It is of great importance to make a careful differential diagnosis as the treatment for these conditions is entirely different from that adopted for retrodisplacement of the gravid uterus. Particularly is it necessary to differentiate the condition from an extra-uterine gestation. Attempts to replace a supposed gravid uterus, which is really an ectopic pregnancy, may result in a fatal attack of intra-peritoneal hæmorrhage. The following diagnostic points should be borne in mind:—

(1)

	<i>Extra-uterine Gestation with Pelvic Hæmatocele.</i>	<i>Retroverted Gravid Uterus.</i>
1. Amenorrhœa . . .	Present; may be atypical.	Typical amenorrhœa.
2. Early signs of pregnancy.	Present, but not prominent, as complications may arise in the first few weeks.	Present and of longer duration, usually before symptoms are produced.
3. Pain . . .	Severe and typical in its onset due to rupture.	Absent; occasionally a dull aching pain in the back.
4. Urinary difficulty .	Seldom marked.	Prominent and an early symptom.
5. Hæmorrhage . . .	May be slight externally, but marked signs of internal bleeding.	External hæmorrhage may be present; signs and symptoms proportionate to external blood loss, if tending to abort.

	<i>Extra-uterine Gestation with Pelvic Hæmatocele.</i>	<i>Retroverted Gravid Uterus.</i>
6. Bimanual examination.	Body of uterus in normal position or slightly tilted upwards, with the cervix pointing downwards.	Body of uterus absent from the normal position, but felt in Douglas' pouch, the cervix usually tilted upwards and forwards.
7. Swelling	Boggy, occasionally pulsatile, posteriorly and towards one side of the body of the uterus.	Elastic soft swelling, occasionally contracting and displaced posteriorly in Douglas' pouch.
8. Colour of discharge .	Rather brownish with occasional gritty particles.	May be bright red if aborting.
9. Contents passed . .	A decidual cast or portions thereof.	Portions of the ovum with chorionic villi may be passed.

In cases of doubt a small hypodermic needle may be passed into the tumour in Douglas' pouch, when on aspiration clear fluid can generally be withdrawn in cases of a gravid uterus, whereas with a hæmatocele, blood occasionally of a dark colour is drawn into the syringe. We attach much significance to this final test in settling the diagnosis.

(2)

	<i>Retroverted Gravid Uterus.</i>	<i>Ovarian Tumour in Pouch of Douglas complicating Preg- nancy.</i>
1. Bladder symptoms .	Prominent and occur early.	No such symptoms generally present.
2. Swelling	Symmetrical and soft and in the uterus.	Usually asymmetrical and of varying consistency, and felt apart from uterine body which is usually in an anteverted position.
3. Position of cervix .	Pointing forwards and upwards and is intimately connected with the swelling, moving with it.	In normal position, or directed posteriorly and does not move with the tumour in Douglas' pouch.
4. Contractions . . .	Intermittent contractions of the body of the uterus may be elicited.	No contractions of the ovarian tumour occur.

(3) A *fibroid tumour* in the posterior wall of a pregnant uterus. In such cases the position of the cervix, which will be more or less normal, will be of considerable help. A fibroid tumour in Douglas' pouch is hard and does not contract and is not elastic. It moves with the uterus and cervix, but gives the uterus an irregular outline and the consistency of the whole mass formed of pregnant uterus and fibroid is no longer uniform.

Prognosis. In the majority of cases retrodisplacement tends to correct itself by spontaneous rectification. In those cases which give rise to symptoms, if diagnosed early, it is generally fairly easy to replace the gravid uterus by one of the methods to be described. If, however, the displacement persists beyond the fourteenth week of pregnancy, the chances of incarceration are increased with the associated dangers due to retention of urine leading to cystitis, gangrene and ascending infection of the urinary tract. Abortion may ensue. In neglected cases the woman dies of septic infection, uræmia or exhaustion.



FIG. 138.—Knee-chest position.

Treatment. (a) *Before Incarceration.* In the early stages the following methods of treatment may be adopted:—

(1) *Reposition by Postural Methods.* The woman is encouraged to adopt the knee-chest or knee-elbow position, morning and evening, for from fifteen minutes to half an hour. Care should be taken to see that the bladder is never overdistended. The effect of this treatment is to favour spontaneous rectification as the uterus grows.

(2) *Reposition by Manual Manipulations together with Postural Methods, if necessary.* In the majority of cases of retroverted gravid uterus, unassociated with complications like adhesions, it is possible to replace the uterus by bimanual manipula-

tion. In such cases it may be an advantage, while attempting to replace the uterus, to make the woman adopt the knee-chest, knee-

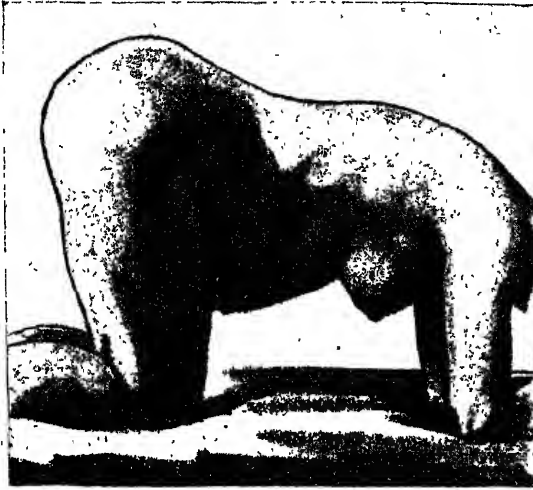


FIG. 139.—Knee-elbow position.

elbow position, or the Trendelenburg position. After completely emptying the bladder and rectum two fingers are introduced into



FIG. 140.—Retroverted gravid uterus: method of replacement.

the posterior fornix and with the other hand on the anterior abdominal wall, the fundus is raised up to its proper position and kept there. It is necessary in such cases to examine the woman at intervals of from four to eight days, to make sure that the uterus has not again become displaced backwards.

After manual reposition a pessary is used to keep the uterus in position and to prevent its slipping back. A suitably sized Smith Hodge's pessary is to be selected which, while maintaining the uterus in a good position, will not slip out of the vagina, or cause undue pressure on the surrounding parts. The pessary should be worn till about the sixteenth or eighteenth week of gestation, by which time the gravid uterus would have grown past the promontory and become an abdominal organ, after which the displacement is not likely to recur as the uterus is by then too large. Once the uterus has become an abdominal organ the pessary should be removed.

Occasionally when the uterus cannot be manipulated into position it is wise to leave the case alone, but the patient should be watched carefully to see that neither bladder nor rectum becomes distended. In some of these cases abortion may occur; but in the majority the uterus rights itself and the organ gradually rises out of the pelvis as the pregnancy proceeds.

(b) *After Incarceration.* When incarceration has occurred the same methods of treatment outlined above may be tried as a preliminary to adopting one of the methods to be described. It is desirable to keep the bladder empty for twenty-four to forty-eight hours and to treat the condition of cystitis if present. In some cases difficulty may be experienced in emptying the bladder due to the elongation of the urethra and its constriction. It may be necessary to perform a suprapubic cystotomy and drain the bladder if a catheter cannot be passed. In cases of severe cystitis, where the bladder requires to be frequently emptied or washed out, it is better to leave a catheter *in situ*. After this preliminary treatment efforts at manual reposition should be made. If they are not successful there are two alternatives:—

- (1) Induction of abortion.
- (2) Reposition of the uterus by the abdominal route.

(1) *Induction of Abortion.* This is occasionally necessary when the possibilities of survival of the ovum are remote and signs and symptoms of a severe bladder infection are present, or the general condition of the patient does not warrant an abdominal

operation. In cases where induction of abortion is decided upon, two methods may be adopted:—

- (1) Rupture of the membranes, so allowing the liquor amnii to drain off.
- (2) Dilatation of the cervix.

Considerable difficulty may be experienced in dilatation of the cervix owing to its position. The difficulty in completely evacuating the uterus is not inconsiderable in such cases.

As an alternative it may perhaps be much more satisfactory to evacuate the uterus through an incision made posteriorly. The uterine cavity is then opened and the contents evacuated. The uterine incision is then closed as also the incision in the vagina.

(2) *Replacement of the Gravid Uterus by the Abdominal Route.* This operation is more frequently resorted to now; but it must be emphasised that it should be done at an earlier stage and not when the impaction has led to severe inflammation and sloughing of the bladder walls. This operation should be done only when the bladder has not gone to the stage of gangrene and when there are no symptoms of acute peritonitis. After separation of any adhesions the uterus is replaced and suspended in an anteverted position. After this treatment the patient is given repeated doses of morphia or some other uterine sedative for the first twenty-four hours to reduce the possibility of abortion, and during the operation itself manipulative measures must be reduced to a minimum and carried out as gently as possible.

A complication of grave significance is the inflammation of the bladder already referred to. It is important to treat this condition during the early stages. Careful emptying of the bladder is necessary. Occasionally gangrene of the bladder with the escape of foul urine and pus and shreds of denuded membrane may occur. When a diagnosis of this condition is made free drainage is absolutely essential. This can be done by the vaginal route by opening through the anterior fornix into the base of the bladder. Urinary antiseptics, such as hexamine in one form or other, may be administered orally or intravenously. The use of sulphonamides is very beneficial in such cases.

Occasionally it may be necessary to open the bladder suprapubically. In cases where severe bladder symptoms are present it is not desirable to attempt induction of abortion, or undertake any operative methods for the replacement of the gravid uterus till the infection of the bladder has first been brought under control. Once this has been achieved the uterus may be replaced or emptied, may be considered necessary.

(3) SACCULATION OF THE UTERUS

Sacculation is said to occur when one wall of the gravid uterus remains in the pelvic cavity, while the other grows into the abdomen to accommodate the growing foetus.

Two distinct varieties may be noted: anterior sacculation and posterior sacculation.

In the anterior type, the cervix is directed towards the sacral promontory or the hollow of the sacrum and lies posteriorly, while in front of it and in close relationship to the bladder a saccule of the uterus is formed by the non-expanded anterior uterine wall. The fundus has become attached to the anterior abdominal wall low down and only the posterior wall can expand.

In posterior sacculation, on the other hand, the cervix is directed towards the symphysis pubis, and occasionally may lie above it. A saccule is formed by the non-expanded posterior wall of the uterus which fills the hollow of the sacrum, while the greater part of the growing foetus is accommodated by increased growth of the anterior wall of the uterus. Posterior sacculation is the type that occurs in cases of retroverted gravid uterus.

Causes. Sacculations of the uterus generally result from displacements of the gravid uterus.

In retrodisplacements of the gravid uterus posterior sacculation of the uterus occurs, while anterior sacculation may result in conditions associated with anterior displacements, or in cases of ventrofixation when this operation has not been properly performed.

The conditions favouring sacculation are fundal adhesions, presence of fibroid tumours or occasionally a prominent sacral promontory overhanging and preventing escape of the fundus of the gravid uterus into the abdomen.

Signs and Symptoms. In the early stages the signs and symptoms are referable to retrodisplacement of the uterus, such as difficulty in micturition, or retention of urine. When, however, sacculation has resulted symptoms gradually abate, and not till the patient actually goes into labour may the condition be recognised. When labour starts the contractions of the uterus do not result in dilatation of the cervix. The extreme displacement of the cervical os prevents its being taken up in the first stage of labour, and the forces of uterine contractions are ineffectual as they are directed towards the cupola of the saccule and not towards the cervical canal. Labour is thus prolonged, and in extreme cases the condition may result in secondary uterine inertia or uterine rupture. Fortunately, in the majority of cases, such serious terminations do

not result; the cervix is taken up to some extent, and when the condition is recognised it is usually possible to pull the cervix into position and dilate it manually.

Treatment. If delay in labour occurs, attempts should be made to draw the cervix down and gradually dilate it. Once dilatation has been rendered possible treatment becomes simple. The delivery may be effected either by the application of forceps, or in some cases where the head has not descended by internal podalic version and extraction. Tears of the cervix are sometimes inevitable. In some cases it may be necessary to make incisions into the cervix.

If it be considered that the cervix is not likely to respond to dilatation either by manual methods or by incisions to give sufficient passage for vaginal delivery, the question of an abdominal Cæsarean section will have to be decided.

When the saccule is very definite and presses low into the vaginal cavity, the vaginal mode of delivery by hysterotomy may be preferable. The bladder or the rectum may have to be separated and an incision made into the saccule in the median line, extending up from the cervical canal. After opening into the lower uterine segment the delivery is completed. Where, however, conditions are not favourable for vaginal hysterotomy an abdominal Cæsarean section can be performed.

2. Anterior (Forward) Displacements of the Gravid Uterus

Two varieties of anterior displacements have been noted: (1) anteversion and (2) antelexion. The normal attitude of the non-gravid uterus is one of slight anteversion and antelexion. It is only in those cases where this position becomes exaggerated that it is pathological. Anteversion is much more common than antelexion of the gravid uterus.

Causes. (1) Weak abdominal parietes favouring the forward displacement of the gravid uterus, producing the condition known as a pendulous abdomen. In such cases the anteversion may be so extreme that occasionally the fundus lies at a lower level than the lower pole of the uterus. Multiparæ suffer much more commonly from this affection than primiparæ. With the increase in the number of pregnancies the abdominal wall becomes very much weakened and flaccid and the muscles atrophy, so that there is a tendency for anteversion to occur. Divarication of the recti may also take place in these cases increasing the forward displacement.

In the tropics the condition is due to improper nutrition, particularly lack of vitamins, producing an extreme degree of thinness of the abdominal wall after even one or two pregnancies.

(2) The displacement may often be met with in contractions of the pelvis, particularly in those where there is associated kyphosis, lordosis or spondylolisthesis.

(3) In cases of twins, large foetuses, tumours complicating pregnancy and hydramnios the condition may occur.

Signs and Symptoms. During pregnancy an abnormal feeling of heaviness and general abdominal discomfort will be complained of in the majority of cases. Pressure and pulling on the bladder may give rise to frequency of micturition. Dragging pains in the loins and difficulty in locomotion may cause a sedentary habit of life which in turn leads to other disorders. Sometimes the pressure may result in the skin of the lower abdomen becoming œdematous; varices and œdema of the vulva may also occur.

During labour severe dystocia may arise. The forward displacement results in the cervix being pushed backwards towards the hollow of the sacrum; occasionally it may even be above the level of the sacral promontory. In such cases the force of the uterine contractions is directed posteriorly and not along the axis of the birth canal. Dilatation is delayed, the presenting part is displaced posteriorly, and engagement of the head in the brim of the pelvis does not occur. Malpresentations are therefore frequent. Owing to premature rupture of the membranes prolapse of the cord may result. The labour is usually prolonged.

Prognosis—Maternal. The increased risks of complication during pregnancy, and the difficulties that may occur during the course of labour render the prognosis unfavourable for the mother. Delay in dilatation of the cervix, malpresentations and malpositions, and the necessity for interference in a large number of cases render the prognosis worse. In neglected cases prolonged labour may result in rupture of the uterus. The chances of infection are increased owing to the delay and the need for operative interference to terminate labour.

Fœtal. The fœtal risks are materially increased. Malpresentations and malpositions, prolapse of the cord, prolongation of the stages of labour and the increased pressure of the uterine contractions after the fluid has drained away, all render the prognosis graver for the child. Fœtal mortality is therefore very high.

Treatment. In the majority of cases antenatal care will greatly diminish the risks incidental to this condition. The woman should be fitted with an abdominal binder or corset suited to the period of pregnancy. It is not desirable that she should indulge in any

heavy exercises or exert herself in her household duties. During labour the woman should be kept in the recumbent dorsal posture and a tight abdominal binder applied, so that the uterus may be braced back. Malpresentations, if present, should be corrected. Once the head engages in the brim of the pelvis labour pains usually proceed in a more orderly manner.

There may be delay, however, in the second stage of labour owing to the weakness of the accessory muscles of labour, and help may be necessary. The application of forceps, or in some cases an internal podalic version, followed by extraction, may be required.

Where, however, the anteversion is due to a contraction of the brim of the pelvis, which has interfered with the engagement of the head, the treatment should be directed to the causative factor, viz., the contraction of the pelvis. The mode of delivery will depend upon the variety and the extent of contraction. Usually it is safer to perform a Cæsarean section, as the condition is not likely to result without there being a fairly severe degree of contraction at the brim.

During the puerperium occasionally antelexion prevents the escape of lochia and the condition of lochiometra results. In such cases massaging the uterus, injections of pituitary extract and a tight abdominal binder with a pad applied just above the pubes are sufficient to promote proper involution of the uterus.

Ventrofixation and Ventrosuspension. A considerable literature has gathered around these operations and the serious dystocia that may follow them if the woman becomes pregnant. It has been emphasised that these operations are attended with such grave risks that they should never be done in the child-bearing period. Whitridge Williams goes so far as to say that "During the child-bearing period, fixation should never be done, unless it is preceded by some procedure which will effect a permanent sterilisation, while suspension should be practised only when urgently indicated." DeLee opines: "The frequency of abortion, difficult labour, postpartum hæmorrhage and the necessity for capital operations to overcome obstruction should forbid the practice of ventral fixation in the child-bearing woman, an opinion also held by Craggon and Pollock." Curtis is of the same opinion: "Ventre fixation, on the other hand," says the author of the article, "should never be done without sterilisation or unless the woman is past the menopause. In this operation sewing the fundus of the uterus into the lower angle of the fascia of the abdominal wound prevents rising of the uterus into the abdomen. It would produce abortion in some cases, or at least dangerous sacculation of the posterior wall in those cases that go on to term." Jellett is of the

opinion and commends it only in women past the child-bearing age.

In refreshing contrast to these extreme opinions may be mentioned the observations of Berkeley and Bonney, who state: "The effect of ventrofixation of the uterus on pregnancy and labour entirely depends upon the situation and the extent of the artificial attachment. Attachment of the uterus to the anterior abdominal wall, if performed in the most approved method, that is by suturing a limited area of the anterior uterine wall to the parietal peritoneum (ventrosuspension), is not found to interfere materially either with pregnancy or labour. When, however, a large area of the uterine wall has been attached to the parietal peritoneum and fascia, difficulties arise in direct proportion to the firmness of the attachment. This is especially so when the uterus has been fixed directly to the abdominal aponeurosis through a gap intentionally created in the parietal peritoneum (ventrofixation)."

We support the last opinion from considerable experience, having performed the operation in several hundreds of cases and having noted the effects of pregnancy and labour after such an operative technique. We would emphasise, with Berkeley and Bonney, that in the main the technique of the operation is important and much depends upon it. If the uterus is fixed on its anterior aspect in the median line, equidistant between the two cornual ends and just below the fundus, over a small area by a couple of sutures to the anterior parietal peritoneum and the recti, no difficulty of any sort is experienced. A short, stout ligament forms, which undergoes changes along with the uterine musculature, during pregnancy and puerperium, hypertrophying in the former condition and involuting in the puerperium.

The situation at which the uterus is fixed to the abdominal wall is also of importance. We do not recommend the low fixation, but prefer the mid or the high fixation, wherein the uterus is pulled up and fixed to the abdominal wall at a point near the junction of the upper two-thirds and the lower third of the line joining the umbilicus and the midpoint of the symphysis pubis.

In cases where displacements are complicated with prolapse the fixation may be done at a still higher point, almost midway between the umbilicus and the symphysis pubis. We have not experienced any difficulty after the operation, and dystocia during labour has not been in excess of what might have been expected in the absence of such an operation. Occasionally help with forceps has been necessary, but usually for reasons unconnected with the operation of fixation.

We would, however, maintain that if the operation is not performed with the proper technique abnormalities do arise, such as sacculation of the uterus, malpresentations, or difficulty with the emptying of the bladder.

The position is entirely different with the operation of vaginal fixation. It should never be done in the child-bearing period, as it does lead to grave dystocia in labour, even if it does not interfere with the course of pregnancy by causing abortion or premature labour. In such cases if the pregnancy progresses to term a Cæsarean section may be the operation of choice, and we prefer the abdominal route. It is necessary to provide for drainage of the uterus whatever may be the route by which the Cæsarean section is done, as in some cases flexion of the uterus results in the greater part of the body being at a lower level than the cervix.

3. Downward Displacements (Prolapse) of the Gravid Uterus

Prolapse of the first or second degree may not infrequently be observed and spontaneous rectification may occur as the uterus rises above the pelvic brim, dragging the prolapsed and hypertrophied cervix with it. Procidencia or prolapse of the third degree is very rarely associated with pregnancy, although cases have been recorded where such a condition has been noted in the early weeks of pregnancy. In conditions of procidencia abortion is likely to occur. If pregnancy continues the uterus rises into the abdomen and the procidencia is partly or completely relieved and the cervix may recede within the vaginal canal. In some cases the cervix may protrude outside and may become infected and ulcerated by the irritation from surrounding parts.

Prolapse of the gravid uterus is one of the most serious complications because of the risks of abortion, difficulty in delivery, lacerations, sepsis and the tendency for inversion of the uterus. The prolapse may be due to previous lacerations and weakening of the uterine ligaments or to pressure from above caused by tumours, ascites, etc.

In the early months care should be taken to see that the cervix is cleaned properly, touched with antiseptics (alcoholic picro solution), and kept in position by means of a clean sterile swab placed in the vaginal canal and changed daily. Preferably a pessary may be inserted for a few weeks. After the uterus enlarges sufficiently to sit on the pelvic brim, the tendency to prolapse diminishes and the pessary can then be removed.

operation is desirable at this stage for the cure of the prolapse as abortion will invariably result.



FIG. 141.—Prolapse of the gravid uterus.
Note the ulceration of the external os.

During the later months, if prolapse of the cervix is present, the perineum and vagina should be cleaned, the prolapsed cervix painted with an antiseptic, replaced, and the patient put to bed with the foot of the bed raised and kept in the recumbent posture for as long a time, even weeks, as is necessary, to prevent a recurrence.

At the time of labour prolapse may give rise to:—

(1) Non-dilatation of the cervix; there is difficulty in the cervix being taken up.

(2) Tendency for prolapse is increased with each pain. The prolapsed cervix and a portion of the lower uterine segment may project outside the introitus vaginae. This increases the risks of sepsis and may render artificial assistance necessary. Owing to lack of full dilatation lacerations of the cervix may be inevitable.

Treatment during labour depends upon the degree of prolapse, condition of the cervix, presentation, period of pregnancy and the stage of labour at which the patient is seen.

In the milder forms manual dilatation of the cervix and careful extraction may be all that is necessary. In other cases, after taking antiseptic precautions, incisions of the cervix or vaginal hysterotomy

may be indicated. In some rare cases lower segment section may have to be done.

During the third stage of labour there is a risk for postpartum hæmorrhage. The fundus is likely to be placed into the hollow of the sacrum, and with retracted puerperal uterus it is difficult to control the fundus by the tone of the uterus. In such cases we have to push it into the abdomen by plugging the posterior vaginal wall with sterile artificial sponges. The uterus can then be controlled and stimulated by massage. The placenta may be retained though separated and manual removal may be necessary.

During the puerperium the condition of the cervix should be carefully noted and, if necessary, touched with silver nitrate from time to time, so as to prevent any spread of infection.

Hypertrophic Elongation of the Cervix

Closely simulating prolapse, is the condition of hypertrophic elongation of the cervix. Usually, this condition, pregnancy does not occur, but when it does, the elongation may persist.

A careful bimanual examination will, however, show that the body of the uterus is in its normal position and that the elongation is purely cervical. It is desirable in such cases to keep the cervix within the vaginal canal, if it has not protruded with the growth of the uterus upwards into the abdominal cavity. The same precautions should be taken to keep the cervix moist by painting with antiseptics and by using sterile sponges.

When the patient goes into labour with hypertrophic elongation of the cervix, difficulties may arise in the dilatation of the cervical canal. The cervix is generally taken up, and the first stage of labour is prolonged. Artificial dilatation may be required, or in some cases incisions of the cervix may be necessary. The cervix is sutured thereafter. Such patients are liable to have the cervix amputated at a later stage. In such pregnancies the difficulties of cervical dilatation in the second stage, however, the condition may be so marked that the cervix does not dilate at all, a lower segment Cæsarean section being necessary in such cases.

CYSTOCELE AND RECTOCELE

Cystocele and rectocele complicating pregnancy are associated with some degree of prolapse; but either may occur independently and give rise to considerable difficulties.

occur usually in multiparæ. In cystocele the difficulties in regard to emptying of the bladder in the early months of pregnancy are exaggerated. With the growth of the uterus during the early weeks and the pressure it exerts, together with the congestion, the cystocele and rectocele may become more pronounced and give rise to a great deal of discomfort and occasionally irritation and ulceration. As pregnancy advances there may be a tendency for a partial relief of the condition. Any ulcerating condition of the anterior vaginal wall due to the cystocele must be cleared up during the pregnancy before the onset of labour.

During labour, cystocele and rectocele may sometimes cause considerable dystocia. With each pain the condition becomes exaggerated and dilatation of the cervix may be interfered with. The cervix may not be taken up in the first stage and the external os tends to dilate incompletely. Occasionally it may be necessary to press back the cystocele and rectocele and to complete the dilatation of the cervix manually. Where artificial assistance is needed, as in the application of forceps, care must be taken to see that the bladder is completely emptied and, when traction is applied, an assistant should press against the anterior vaginal wall and keep the cystocele from descending.

TORSION OF THE GRAVID UTERUS

This is a rare complication of pregnancy, and when it does occur is associated with considerable risks to the mother and the foetus.

Torsion may be brought about by adhesions, tumours of the adnexa such as ovarian cysts, and occasionally fibroid tumours. The body of the uterus may rotate through one-fourth to one-half of a circle, on the axis of the cervix. When such rotation occurs, intense congestion of the organ results, leading in some cases to separation of the placenta. The foetus may die *in utero*.

The symptoms of shock, pain, extreme tenderness over the region of the uterus and a certain amount of tenderness and rigidity of the abdominal wall may be present. When torsion occurs through more than a fourth of a circle the adnexa also become deeply congested, and in some cases bleeding may occur from some of the congested vessels. If neglected, the congestion and the consequent inflammation may lead to the onset of symptoms of peritonism, with paresis of the intestines, and the condition of the patient becomes progressively worse.

Treatment. This consists in immediate laparotomy. In some cases it may be possible to correct the displacement and leave the uterus *in situ* if the pregnancy has not been affected by torsion, removing, if possible, any factors responsible for the condition. More usually it is necessary to perform an abdominal hysterotomy and evacuate the uterus. If the condition of the uterine wall, however, is such that sloughing is likely to occur on account of severe inflammation, hysterectomy is advisable; or if the tubes and other adnexa are affected and are likely to undergo sloughing it may be necessary to remove them as well with the uterus. Where the uterus is the seat of fibroids it is wise to do a hysterectomy rather than attempt to enucleate the fibroids after hysterotomy in a uterus that is congested and is the seat of unhealthy muscular fibres.

CHAPTER XXXV

DYSTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS (*continued*)

3. Tumours of the Uterus, Adnexa and Neighbouring Structures complicating Pregnancy, Labour and the Puerperium

SEVERAL varieties of tumours may complicate pregnancy and labour. They may be classified under the following heads:—

Tumours of the Uterine Body.

Fibroids; carcinoma of the body of the uterus.

Tumours of the Uterine Cervix.

Fibroids; carcinoma of the cervix.

Tumours of the Vagina.

Cysts of the vagina; carcinoma of the vagina.

Tumours of the Vulvar Outlet and Perineum.

Cysts of Bartholin's gland; elephantoid growth of the vulvar outlet; infective granuloma of the vulva and carcinoma vulva.

Tumours of the Adnexa.

Ovary. Solid tumours of the ovary; cystic tumours; unilocular cysts; multilocular cysts; dermoid cysts.

Parovarium. Parovarian cysts.

Tumours of the surrounding Organs.

Bladder. Neoplasms of the bladder; "stone in the bladder".

Rectum—New Growths. Adenocarcinoma of the rectum; benign tumours of the rectum; "syphilitic growth" of the rectum.

Pelvis, Bony. Ivory exostosis.

Displaced Viscera. Wandering kidney, movable spleen and omental masses may occasionally be displaced into the pelvis and act as pelvic tumours as far as pregnancy and labour are concerned.

The most important and common of the tumours complicating pregnancy are, however, fibroids, ovarian neoplasms and carcinoma of the cervix, and these will be dealt with in detail.

Fibroid Tumours

Fibroid tumours complicating pregnancy may be of three varieties: submucous, interstitial or subperitoneal.

Fibroids of the uterus tend to diminish the chances of pregnancy; but when pregnancy does occur, important changes take place in the fibroids as well as in the associated pregnancy.

EFFECT OF PREGNANCY ON FIBROIDS

During pregnancy fibroids tend to hypertrophy and become enlarged as they share in the general enlargement of the uterine musculature. In addition to hypertrophy, degenerative changes are much more likely to occur during pregnancy or the puerperium, the chief of these being:—

- (1) Red degeneration or necrobiosis.
- (2) Inflammatory changes resulting in the formation of adhesions.
- (3) Occasionally suppuration and gangrene.
- (4) Torsion of the subperitoneal fibroids.

The increased tendency for degenerative changes and the rapid growth of the tumour may cause in the later months of pregnancy pain and pressure symptoms, the latter in some cases being so marked as to give rise to extreme dyspnoea, palpitation of the heart, indigestion and difficulty in micturition.

EFFECT OF FIBROIDS ON PREGNANCY

The effect of fibroids on pregnancy may also be marked. In the early weeks there is a distinct tendency for:—

- (1) Displacements of the gravid uterus, depending upon the situation of the fibroid.
- (2) An increased tendency for abortion.
- (3) Possibilities of sacculation of the uterus.
- (4) Incarceration of the uterus with retention of urine and the associated serious sequelae.

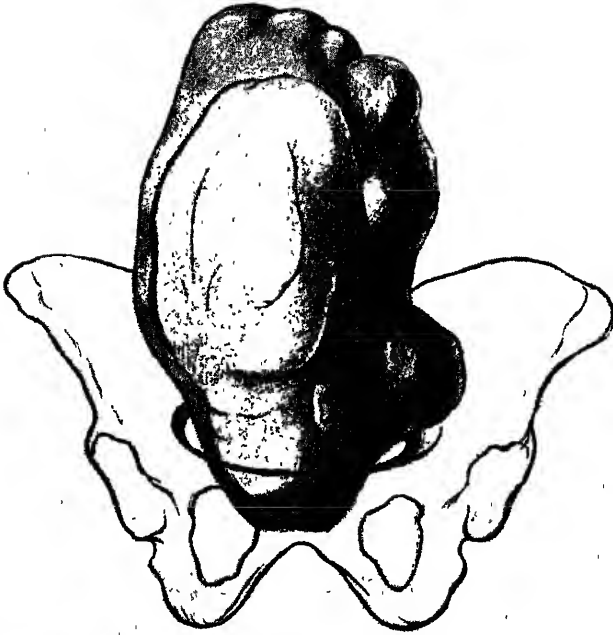


FIG. 142.—Multiple fibroids complicating pregnancy (Bumm).

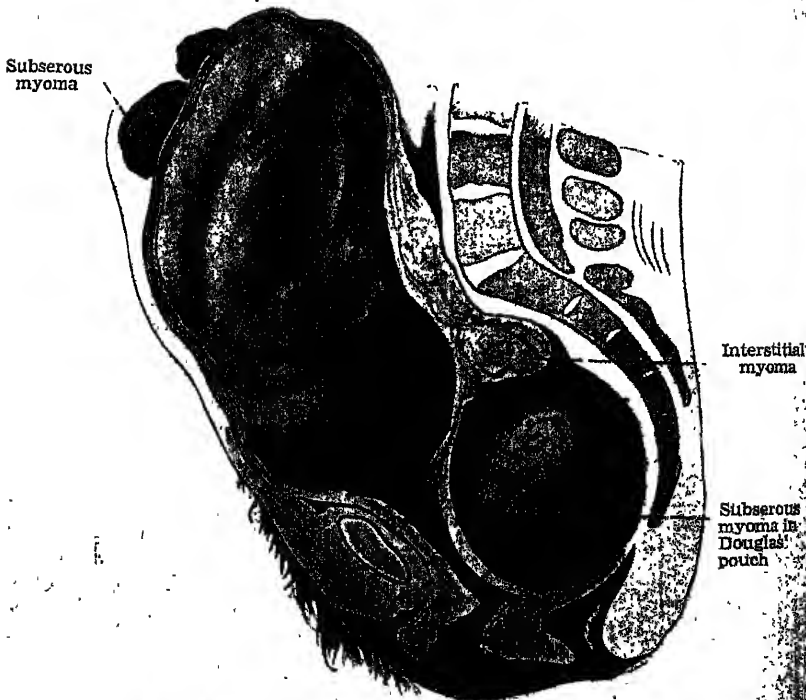


FIG. 143.—Multiple fibroids complicating pregnancy (Bumm).

Note the subserous myoma in Douglas' pouch.

Retroperitoneal fibroids may cause symptoms at an earlier stage and give rise to more complications than other types, and tend to cause displacement of the gravid uterus. The interstitial and submucous ones favour abortion. Subperitoneal fibroids generally do not have any effect on the course of pregnancy unless they are of large size when pressure symptoms may manifest themselves.

Fibroids tend to the formation of placenta prævia.

In the later months of pregnancy the pressure symptoms may be exaggerated and there is a distinct tendency for the onset of premature labour, which is also favoured by the degenerative changes that fibroids may undergo during pregnancy

EFFECTS OF FIBROIDS ON LABOUR AND THE PUERPERIUM

Apart from the complications already mentioned as occurring during the course of pregnancy, fibroids may give rise to serious complications during labour and the puerperium.

During Labour—First Stage. Besides the onset of premature labour, there is an increased tendency for delay to develop in the first stage due to the lack of efficient uterine contractions. Malpresentations and malpositions are much more frequent because, with cervical and retroperitoneal fibroids and fibroids in the lower uterine segment, the presenting part is prevented from engaging at the brim of the pelvis. These varieties also tend to obstruct labour because of their position. Premature rupture of the membranes and prolapse of the cord are likely to occur.

In the Second Stage. Interference may be necessitated because of the weak uterine contractions, malpresentations, or obstruction caused by the fibroid tumour. If the obstruction is very pronounced it may not be possible for the foetus to be born by the vaginal route, and so delivery by the abdominal route must be considered; for if the woman is allowed to proceed the uterus develops secondary inertia or passes on into tonic contraction, with symptoms of threatened rupture. Eventually rupture takes place if the obstruction is insuperable and suitable aid is not forthcoming.

During the third stage postpartum hæmorrhage is likely to occur because of the comparative inertness of the uterus, the difficulty of obtaining proper retraction on account of the presence of the fibroid, the prolonged stages of labour and the tendency for adhesions of the placenta.

During the Puerperium fibroids may undergo degeneration, the most common form being red degeneration, with sloughing and gangrene. Fibroids may sometimes obstruct the flow of lochia

and cause a lochiometra. They predispose to subinvolution of the uterus and increase the chances of sepsis because of the inflammatory changes that they may themselves undergo. Occasionally during the process of involution interstitial fibroids may become submucous, and if by any chance there is uterine infection septic changes occur. There is increased tendency for inversion of the uterus to occur, either during the third stage of labour or during the puerperium, particularly in cases where the fibroids are situated at the fundus or in the upper uterine segment.

Diagnosis. The frequency with which the presence of fibroids is noted only after confinement, either in the third stage or in the puerperium, serves to demonstrate the difficulty of diagnosing them during pregnancy. Fortunately, in the majority of cases, fibroids do not give rise to any difficulty in labour and complications rarely occur. Often it is only in the puerperium that they may have to be watched with care for possible degenerative changes.

Subperitoneal fibroids, specially when pedunculated, will be felt as hard nodular growths projecting from the uterus. Fibroids on the posterior wall of the uterus are less likely to be recognised. Interstitial fibroids may be mistaken for a foetal part, generally for an elbow or knee when of small size, and for a head or breech when large. The mobility of a foetal part within the uterus as compared to the immobility of the fibroid apart from the uterine wall, helps to differentiate the two conditions. Where fibroids obstruct labour a careful vaginal examination may reveal the presence of the hard growth. It may sometimes be necessary to examine the patient thoroughly under a general anaesthetic before recognising the condition. Not infrequently a large interstitial fibroid noted after delivery may stimulate a second foetus in twins and in some cases an intra-uterine examination may be needed to settle the diagnosis. We have noted a case where a large interstitial fibroid was mistaken for a second foetus after the delivery of the first child and fruitless attempts made at version and extraction.

Sometimes fibroids may be mistaken for ovarian tumours, pyosalpinx, omental adhesions or parametric swellings. A rare form of mistake is to confuse one half of the uterus for a fibroid in a *uterus didelphys* or *bicornis*. Where hard tumours are present on the surface of the uterine wall, as in subperitoneal fibroids, the diagnosis may not be difficult unless there is a fat abdominal wall. Retroperitoneal and cervical fibroids can be recognised by vaginal or bimanual examination; and in cases where there are symptoms suggestive of undue pressure in the pelvis.

presenting part remains high and the pelvis is normal, this should always be done.

The presence of fibroids may give rise to considerable difficulty in diagnosis of pregnancy in the early months. Cases are recorded where gynæcologists of experience have opened the abdomen on the supposition that they were dealing with a fibroid uterus, but found that the uterine enlargement was due to pregnancy. Even after opening the abdomen the general configuration of the uterus, appearance and relative softness may occasionally cause doubt as to whether one was dealing with a pregnant uterus or an interstitial fibroid which has enlarged the uterus uniformly. The points of differential diagnosis between fibroids and pregnancy have already been dealt with in the chapter on the diagnosis of pregnancy. The importance of the Aschheim-Zondek test may here be reiterated as well as the exploration of the uterine cavity with a needle as a final and conclusive test of the presence or otherwise of pregnancy in association with fibroids.

Prognosis. The prognosis, when fibroids complicate pregnancy, depends on the following points:—

(1) *The Variety of Fibroids.* Interstitial and submucous fibroids are likely to give rise to more complications and render the prognosis worse than subperitoneal ones.

(2) *Size and Number of the Fibroids.* The larger the fibroid the greater is the tendency for pressure symptoms and for anomalies in the course of labour, particularly when the fibroid is situated in the lower uterine segment or cervix. The greater the number of fibroids the greater is the chance of uterine inertia and postpartum hæmorrhage.

(3) *The Situation of the Fibroid.* Of even greater importance than the size of the fibroid is the situation thereof. Retroperitoneal fibroids and cervical fibroids are likely to give rise to obstruction during labour, and they may undergo degenerative changes during the puerperium.

(4) *Degenerative Changes.* This perhaps is one of the most serious of complications. Red degeneration, inflammation and sloughing of fibroids may lead to serious consequences in pregnancy or the puerperium, and the prognosis is therefore much worse.

(5) *The Nature of the Treatment adopted.* The facilities available for the proper treatment of fibroids complicating pregnancy or labour should be taken into consideration. If the patient can be treated in a well-equipped hospital and Cæsarean section, with or without hysterectomy, is performed at an early stage, the prognosis may not be unfavourable, but in neglected cases where the patient is referred to a hospital after several hours of obstructed

labour, the cause of obstruction being a fibroid situated at the lower uterine segment or in Douglas's pouch, the prognosis is definitely worse, no matter what method of treatment is then adopted.

Fœtal Prognosis. When fibroids are present there is a tendency for abortion or premature labour. In other cases the stage at which the patient comes in for treatment may necessitate destructive operations on the child before delivery can be effected. On the whole it may be said that the presence of fibroids renders the fœtal prognosis worse owing to the number of complications that are likely to arise during pregnancy and in labour.

Treatment. Certain general principles may be laid down in regard to the treatment of fibroids complicating pregnancy:—

(1) It is a matter of common experience that in the majority of cases of fibroids complicating pregnancy no discomfort or trouble may arise; there is no interference with the process of labour and the puerperium is uneventful. As a rule it is wise not to interfere with the fibroids unless a definite indication is present. An attitude of watchful expectancy is most desirable in such cases.

(2) If for any reasons, it is considered necessary to operate, it is best to do it at as late a stage in pregnancy as possible, or early in labour, with a view to give the best chance possible to the fœtus.

(3) Under certain conditions operation may be inevitable and in such cases hysterotomy may be found necessary irrespective of the period of gestation.

(4) When operative procedures are adopted it is desirable to deal with the fibroids at the same time either by enucleating them or by performing hysterectomy. Such radical methods of treatment should, of course, only be adopted when the condition of the patient permits of their being performed with safety.

We shall deal with the treatment in the various stages of pregnancy, labour and puerperium.

(A) *In the Early Weeks of Pregnancy.* Where no symptoms exist there is no necessity to interfere; the patient, however, should be carefully watched throughout pregnancy. The possibility of abortion occurring in the early weeks should be kept in mind. The tendency for retroversion of the gravid uterus should be remembered and measures adopted to correct such displacement should it occur.

(B) *In the later weeks of pregnancy* interference because of fibromyomata may become necessary owing to any one of the following causes:—

(1) Degenerative changes of fibroids, particularly necrobic

(2) Severe hæmorrhage. This may be sometimes intra-peritoneal due to rupture of a vessel on the surface of a fibroid or intrauterine due to partial separation of the products of conception.

(3) Serious pressure symptoms. Pressure symptoms may be due either to the large size or situation of the tumour. When the fibroid is of large size it causes undue distension of the abdomen and pressure on the abdominal viscera and neighbouring structures. Fibroids, even though small in size, if they remain within the pelvis, may cause pressure symptoms.

(4) Torsion. Occasionally torsion may actually involve the gravid uterus and give rise to serious symptoms characteristic of an acute abdomen. This is most likely with pedunculated sub-peritoneal fibroids.

When such symptoms arise a laparotomy is essential. The further treatment will depend upon the size and situation of the tumour. The following are the methods of treatment that may be adopted :—

- (i) Enucleation of the fibroid, leaving the pregnancy to continue.
- (ii) Cæsarean section and enucleation of the fibromyomata.
- (iii) Cæsarean hysterectomy, subtotal or total.

A method of treatment that may be adopted with fibromyomata in the non-gravid condition, namely, treatment with deep X-ray therapy, is not to be considered in cases where pregnancy co-exists. The risks of irradiation on the foetus are so pronounced that such a remedy should never be attempted.

(C) *Fibromyomata complicating Labour.* Subperitoneal fibroids may not interfere with the course of labour, and in the majority of cases where the fibroids are small labour terminates spontaneously. In some cases, however, the tumour may be small enough not to interfere with labour, but may be bruised and become septic during the puerperium. Occasionally the tumour may be the direct cause of obstruction or of hæmorrhage. It must be remembered, however, that most fibroids develop in the body of the uterus, which during labour forms the upper uterine segment. By virtue of the retraction which occurs, this tends to make fibroids assume a higher level as labour advances. In this way fibroids that appear as if they would cause obstruction when seen antenatally, or early in labour are displaced out of the region of the pelvic brim as labour advances and obstruction is thus averted. Obstruction, however, may occur under certain conditions. A cervical myoma even of small size, because it cannot be carried up out of the pelvis, may cause obstruction to the passage of the child; a submucous

fibroid may project into the internal os and so interfere with the descent of the presenting part; retroperitoneal fibroids and fibroids situated low in the uterine wall tend to remain pelvic and therefore are liable to cause serious obstruction to the course of delivery.

Other complications that may arise are:—

(1) *Hæmorrhage.* (a) This may be due to the tearing of adhesions, omental or otherwise, during the contractions of the uterus. (b) The increased risk of postpartum hæmorrhage is due to insufficient retraction consequent on the presence of fibroids, or to an adherent placenta.

(2) *Inversion of the uterus.*

In cases where fibroids are situated above the pelvic brim and are not therefore likely to obstruct the passage of the foetus, labour is allowed to proceed under careful supervision. If small fibroids are situated in the pelvis it may occasionally be possible to push them above the pelvic brim so as not to cause any obstruction; in some cases they become displaced above the brim by the natural process of labour when the cervix is taken up. In no case where a fibroid tumour of any size persists in the pelvis is it desirable to allow the presenting part to descend or to extract it with force. The dangers associated with such forcible extraction are:—

(1) Injury to the presenting part such as intracranial hæmorrhage.

(2) Serious compression of the fibroid may later result in necrosis or infection during the puerperium.

(3) Injury to the rectum and bladder, may result in the formation of a rectovaginal or vesicovaginal fistula at a later date.

(4) Occasionally the engorged and dilated veins over the tumour may be injured and fatal hæmorrhage into the peritoneal cavity may occur.

In general, therefore, labour obstructed by myomata is best treated by abdominal operation, unless the myoma can be safely removed through the vaginal route. Pedunculated cervical fibroids may be removed by the vaginal route and labour allowed to progress, but in other cases the abdominal route offers the only safe method of treatment in the interests of the mother and the child.

When a case is dealt with by the abdominal route, one of four methods may be adopted:—

(1) *Myomectomy*, followed by the extraction of the foetus *per vaginam*. We do not advocate this method, as we consider that very little advantage is gained and the chances of getting a living child are rendered more difficult in addition to the tendency to postpartum hæmorrhage.

(2) *Cæsarean Section followed by Myomectomy.* This is the ideal method of treatment in the majority of cases, and should be adopted wherever possible. After the foetus has been delivered through the abdominal route, if the number of fibroids is not excessive and they are so situated that they can be easily removed, myomectomy should be performed. A danger, however, is an increased tendency for the uterus to bleed, and it is not always easy to control the hæmorrhage after myomectomy in a full term uterus. Moreover, in such cases, the additional risk of sepsis must also be borne in mind.

(3) *Cæsarean Section followed by Hysterectomy, Total or Subtotal.* This is the method generally preferred in cases where the uterus is too extensively diseased to be of much service later. Where the fibroids are multiple and the woman is a multipara, and if there is any suspicion of infection, the proper line of treatment is to perform Cæsarean hysterectomy. Under such circumstances the child is first delivered and the uterine incision sutured by a few interrupted stitches and then hysterectomy performed. The choice between supravaginal and total hysterectomy depends largely upon the condition of the patient, the position of the tumour and the possibilities of septic infection. Total hysterectomy has a slightly higher maternal mortality and should not therefore be lightly undertaken in those cases where the condition of the patient does not warrant it. But if the tumours are situated low, and particularly if cervical fibroids are present, or if there are definite signs of septic infection, total hysterectomy is the better choice.

(4) *Conservative Cæsarean Section.* This is probably the least desirable method of treatment, for it does not deal with the fibroids and not only makes a subsequent operation essential, but leaves room for the possibility of degenerative changes or other complications developing in the puerperium.

Another indication for abdominal operation, apart from obstruction to labour, is intraperitoneal hæmorrhage, which may occur during the course of labour due to the tearing of omental adhesions by the force of the uterine contractions. When any sort of intraperitoneal bleeding is present it is always wise to perform a laparotomy and deal with the condition. When a laparotomy is done this must be followed by the delivery of the child through the abdominal route and the treatment of the associated condition of fibroids.

Test Labour. The question of test labour for fibroids complicating pregnancy sometimes arises. Whenever test labour is adopted, an attitude of watchful expectancy throughout the course of labour is very essential, as at any stage it may be necessary to

resort to one of the operative methods of treatment outlined above. Test labour may be undertaken in the following circumstances :—

- (1) If the fibroids are entirely subperitoneal.
- (2) If they are interstitial and situated in the upper uterine segment.
- (3) If they are retroperitoneal, small in size and mobile.
- (4) In cases of premature labour, provided the obstruction is not pronounced.

The contraindications to a test labour are :—

- (1) Large retroperitoneal fibroids.
- (2) Fibroids impacted in the pelvic cavity.
- (3) Fibroids which show evidence of degenerative changes.
- (4) Large cervical fibroids, sessile or pedunculated. Unless it is possible to remove them by the vaginal route before allowing test labour to occur.

(5) If there is definite evidence of disease of the adnexa, such as ovarian cysts or inflammatory conditions of the tubes.

(D) *Fibromyomata complicating the Puerperium.* Although labour may have terminated through the natural passages, troubles may arise during the puerperium because of the presence of fibromyomata. This generally occurs in the submucous and interstitial varieties, although even the subserous ones may occasionally be injured during labour, or undergo torsion of the pedicle and thus lead to congestion or even occasionally to torsion of the whole puerperal uterus. The changes that may occur are infection, necrosis and necrobiosis. Occasionally an interstitial fibroid may tend to become submucous and give rise to hæmorrhage, and a submucous one may become polypoid and predispose to a degree of inversion.

So far as the uterus is concerned the presence of fibroids may lead to subinvolution, increased risks of septic infection, and a tendency for secondary postpartum hæmorrhage and displacements of the uterus. Submucous fibroids situated low down may occlude the cervical canal and favour the development of lochiometra, leading later to pyometra.

Ecbolics are contraindicated in the puerperium in such conditions, as they favour the extrusion of fibroids of the interstitial variety into the uterine cavity.

When myomata are recognised during the puerperium, or have been noted during pregnancy or labour, a careful watch must be kept over the patient for the appearance of any of the complications noted above. The symptoms to be watched for are pain and tenderness over the uterus, fever, hæmorrhage and

an offensive lochia or suppression of lochia. If symptoms of torsion manifest themselves it is a clear indication for interference.

Treatment depends upon the variety of the tumour. Submucous tumours should be removed by the vaginal route; if pedunculated, the pedicle should be twisted and then cut through with a pair of scissors. In cases of interstitial fibroids or subperitoneal fibroids, enucleation must be done through the abdominal route. If enucleation is impossible or there is evidence of sepsis, or if the uterus has rotated with the tumour and the uterine musculature is diseased, the question of the removal of the uterus should be considered.

A word of caution may be given here with regard to the treatment of submucous fibroids. It is necessary to be quite sure about the diagnosis of this condition, as not infrequently inversion of the uterus has been mistaken for a small submucous fibroid situated near the fundus. Where both inversion and a submucous fibroid occur together, steps should be taken to reduce the inversion after removal of the tumour. Displacements of the uterus should also be corrected. Where degeneration occurs in a large fibroid, particularly an interstitial fibroid, it is best to perform hysterectomy.

If secondary hæmorrhage takes place it may have to be controlled by tamponage of the vagina, or in some cases it may be wiser to operate and remove the uterus.

In all cases where fibroids have been noted during the puerperium, the patient should be cautioned about them, examined eight to twelve weeks later, and suitable treatment adopted. Occasionally the fibroids share in the involution of the uterus and atrophy; but in the majority of cases, especially with big fibroids, the patient should be advised to undergo treatment at a later stage.

CHAPTER XXXVI

DYSTOCIA DUE TO ABNORMALITIES OR ANOMALIES OF THE MATERNAL SOFT PARTS (*continued*)

Ovarian Tumours complicating Pregnancy and Labour

Tumours of the ovary complicating pregnancy may be either cystic or solid.

Among the *cystic tumours* are:—

Simple serous cysts.

Multilocular cysts.

Dermoid cysts.

Papilliferous cysts.

The *solid tumours* are:—

Fibromata.

Adenomata.

Malignant tumours, either carcinomata or sarcomata.

CYSTIC TUMOURS

The commoner varieties met with are the simple serous or multilocular cysts. Next in frequency come the dermoids. Solid tumours of the ovary are comparatively rare, occurring perhaps in less than 5 per cent. of the cases.

Effect of Pregnancy on Ovarian Cysts. Pregnancy does not appear to have particular effect upon the growth of ovarian cysts, in contradistinction to its well-known effect on fibromata. Other changes may take place, such as torsion, rupture or infection. Infection is more likely to occur during the puerperium than in pregnancy. Incarceration, suppuration and necrosis may also take place. This is more frequently so with dermoid cysts which have a tendency to remain in the pelvis than with the ordinary types of simple serous or multilocular cysts.

Effects of Ovarian Tumours on Pregnancy. These depend upon the size and situation of the tumour. In the early weeks of pregnancy ovarian tumours may give rise to pressure symptoms particularly referable to the bladder. There is a greater tendency



FIG. 144.—Ovarian tumour obstructing labour (Summ).

for abortion and miscarriage, and in some cases the subjective symptoms of the first trimester of pregnancy, such as nausea, vomiting, etc., are exaggerated. In the later weeks pain is not

infrequently complained of, and difficulty in micturition may persist. Owing to the increase in the size of the abdomen, disturbances in the respiratory and circulatory systems may occur as well as other pressure symptoms usually associated with an overdistended abdomen. Malpresentations are likely to occur, particularly in those cases where the ovarian cysts remain either wholly or partially pelvic. In some cases the uterus may be displaced laterally or forward, and when this is marked malpresentations and malpositions of the foetus occur.

Symptoms. The presence of ovarian cysts may not give rise to any symptoms whatsoever, particularly if they are of moderate size and not confined to the pelvis. The symptoms referable to ovarian cysts are generally due to:—

- (1) Incarceration.
- (2) The large size of the tumour.
- (3) The complications that may set in, consequent upon changes in the tumour.

Incarceration. When ovarian cysts such as dermoids are situated in the pelvis, pain, frequency of micturition and retention of urine, constipation, shooting pains down the thighs, and in the early period of pregnancy an exaggeration of reflex symptoms like nausea, vomiting, etc., may be present.

Large size of Tumour. When the tumours are of large size they produce pressure symptoms generally from the twenty-eighth week of pregnancy onwards, as in association with the gravid uterus the abdomen becomes overdistended; dyspnoea, precordial pain, dyspepsia, constipation, difficulty in micturition and symptoms referable to pressure upon the veins, nerves and the other abdominal viscera may be noticed.

Complications. More often, when a patient complains of symptoms, they are associated with changes in the ovarian cyst, namely, torsion, rupture, or infective changes.

Torsion. This complication occurs not infrequently during pregnancy, more often during the puerperium. It is supposed to be slightly more frequent in association with pregnancy than in the non-gravid condition. The symptoms are sudden and severe pain in the abdomen, associated with all the features of shock and collapse; tenderness and a slight amount of abdominal rigidity may also be present. The pulse is rapid; the patient presents an anxious expression; cold clammy sweats may occur, and depending upon the amount of the hæmorrhage that has occurred into the cyst the patient may show the typical symptoms of hæmorrhagic collapse.

On abdominal palpation the tumour may be palpable, and if it had been previously noted an increase in its size may be observed. Torsion may be more gradual, in which case pain and associated symptoms are less severe.

As a result of torsion the tumour may rupture or give rise to adhesive peritonitis. In some cases the adhesions may be to the bowels and the tumour becomes infected.

Rupture of an ovarian cyst is comparatively rare during pregnancy.

Infective changes (suppuration and necrosis) are probably due to conditions quite independent of the gravid state, or in some cases suppuration may have existed before the onset of pregnancy. Suppuration, however, is more likely to occur during the puerperium, especially if infection of the parturient canal occurs.

Diagnosis. The diagnosis is not usually difficult. When the tumour is in the pelvis and the pregnancy is not far advanced a careful bimanual examination will reveal the presence of the cystic tumour alongside of the enlarged uterus.

In the later weeks the tumour may be felt either in the pelvis or in the abdominal cavity by palpation, as a distinct cystic tumour separate from the gravid uterus. Where the cystic tumour is situated posteriorly and there is considerable amount of enlargement of the abdomen, it may be difficult to define the outlines of the tumour and the gravid uterus separately. In such cases if the foetus in the uterus can be palpated easily and an X-ray photograph does not reveal any abnormalities, such as twins, etc., it may be presumed that the associated distension of a cystic nature is most likely due to an ovarian cyst complicating pregnancy.

Sometimes an ovarian cyst may be confused with a fibroid. Occasionally a retrodisplaced gravid uterus may have to be differentiated from an ovarian cyst complicating pregnancy. A careful bimanual examination, noting the position of the cervix and the fundus will help in clearing up the point at issue.

In the earlier weeks of pregnancy a small ovarian cyst may be mistaken for an extra-uterine gestation. Particularly is this mistake likely to arise when it undergoes torsion. The symptoms of hæmorrhage and collapse together with a soft swelling which may occasionally be pulsatile and felt in the pouch of Douglas, may give the impression of a ruptured extra-uterine pregnancy. It may be noted, however, that no bleeding is likely to occur. A laparotomy is indicated in both conditions, and the diagnosis may only be cleared up at operation.

A very rare complication met with once was the condition of torsion of an enlarged spleen with pregnancy, which was mistaken

for either torsion of an ovarian cyst or a ruptured ectopic pregnancy. On opening the abdomen it was found that an enlarged movable malarial spleen had undergone a twist of its pedicle; the spleen was extremely congested, very vascular, and a certain amount of free blood was found in the abdominal cavity. The uterus was sixteen weeks pregnant. Splenectomy was done and the patient made an uneventful recovery, pregnancy going on to term and ending with a spontaneous delivery.

Treatment. It is now a well accepted rule that when an ovarian tumour is diagnosed during pregnancy it should be removed at once, irrespective of the size, nature or position of the tumour. The uncertainties with regard to the growth of the tumour and the changes it may undergo, and the complications likely to occur during pregnancy, labour and the puerperium, make this a very sound policy to adopt. We have invariably removed ovarian cysts noted during pregnancy from as early as the eighth week to very nearly full term.

Occasionally it may be desirable, if there are absolutely no symptoms, to postpone the operation for a few weeks in the second or third month of pregnancy so as to avoid the possibility of abortion; otherwise there need be no hesitation in operating at as early a stage as possible.

When the ovarian tumour has to be removed at or near full term, the question of delivering the child by Cæsarean section has to be considered, so as to avoid the strain of labour on a recent abdominal scar. No fixed rule can be laid down, but each case has to be considered on its own merits. It is possible that if the operation is done at term, in a primipara, one may have to consider the possibility of delivery by Cæsarean section. Theoretically, the best method of treatment is to remove the tumour by the abdominal route and to let the child be born *per via naturalis*.

There are exceptions to the general rule of immediate removal of the tumour. If a small cyst is noted well out of the pelvis, either at or near term, it may be well to leave it alone till the patient has been delivered and recovered from the puerperium. In cases where after opening the abdomen the tumour is adherent and exceedingly vascular, and the extirpation of the tumour is associated with considerable risk of hæmorrhage, the tumour may have to be tapped and pregnancy allowed to proceed. As an alternative the removal of the tumour may necessitate the performance of a hysterectomy as well, owing to the intimate association of the tumour with the gravid uterus.

Immediate operation is necessary in cases where torsion of the ovarian cyst has occurred, as well as in those conditions where

inflammatory changes or rupture of the cyst have taken place. In cases where severe pressure symptoms are present, or where there is a suspicion of malignancy, an operation is indicated.

LABOUR COMPLICATED BY OVARIAN TUMOURS

In some cases the presence of the ovarian cyst may not have been diagnosed before labour, or the patient may come under observation for the first time when she is in labour. The effect of labour on ovarian tumours will depend on the position, size, mobility and contents of the tumour. When the tumour is above the presenting part it may be ruptured by the contractions of the uterus, or its pedicle may become twisted, or in some cases it may be so compressed that later in the puerperium it may undergo inflammatory changes. When the tumour is below the presenting part, the pressure of the presenting part may crush or rupture it. In some cases the birth of the child may occasionally displace the tumour upwards into the abdominal cavity where it may undergo torsion.

The Effect of Ovarian Tumours on Labour. This again depends on the size and situation of the tumour. When the tumour is pelvic it will certainly interfere with the descent of the presenting part, the extent of the interference depending upon its size and relative hardness. For this reason dermoid cysts are more likely to cause obstruction to labour than simple serous cysts of the ovary. Mal-presentations and malpositions as a result of the presence of ovarian cysts have already been referred to. The presence of the tumour may interfere with the proper uterine contractions and favour uterine inertia and postpartum hæmorrhage.

Treatment. If the tumour is situated above the presenting part and obstruction is not likely to result, labour may be allowed to progress and the removal of the tumour considered at a later stage. Even in those cases where the tumour is pelvic it must be realised that there is a tendency for the tumour, although not so marked as in fibroid tumours, to rise into the abdominal cavity, especially when the tumour has got a fairly long pedicle. As an alternative it is possible gently, with the woman in the knee-chest or knee-elbow position, to manipulate and push it up above the presenting into the abdominal cavity, where it may not cause any further trouble.

If, however, the tumour continues to remain in the pelvis and is likely to cause obstruction, it is better to operate early and deliver the woman by Cæsarean section and remove the tumour at the same time. In some cases it has been suggested that the tumour

may be removed and labour terminated through the natural passages. This may perhaps be done if the woman has progressed sufficiently in labour and the cervix is dilated so that after the removal of the tumour by the abdominal route it is possible almost immediately to deliver the foetus through the vaginal route either by the application of forceps or by version and extraction. In cases where this is not possible and the woman has already been some time in labour, it is better to perform a lower segment Cæsarean section and deliver the foetus and then remove the ovarian cyst.

Occasionally complications may co-exist, such as adhesions or tortuous veins, which may render it difficult to remove the ovarian cyst, and under such circumstances, considering the condition of the patient, it may be desirable to tap the cyst and complete the delivery and await a more favourable opportunity at a later date to deal with the tumour.

PUERPERIUM COMPLICATED BY OVARIAN TUMOURS

During the puerperium ovarian tumours tend to suppurate if there is any puerperal sepsis. Another complication not infrequently met with is twisting of the ovarian cyst, which is favoured by the rapid involution of the uterus during this period, the laxity of the abdominal walls and the increased mobility of the abdominal viscera. Cysts of the ovary which have been crushed or ruptured may necrose and get infected in the puerperium.

Treatment. There is no particular necessity to remove these tumours during the puerperium unless they undergo degenerative changes; infection, suppuration, torsion or rupture of the cyst are the common indications necessitating immediate laparotomy and removal.

SOLID TUMOURS OF THE OVARY

These may be sarcomata, fibromata, adenomata or carcinomata. Ovarian fibromata, if they are bilateral, generally lead to sterility. Solid tumours are more likely to be situated in Douglas' pouch and to obstruct the course of labour.

Operations on these tumours in the later weeks of pregnancy may present difficulty because of the need to eventrate the gravid uterus before they can be exposed and removed. The risk of hæmorrhage may also necessitate postponement of the operation till the woman goes into labour.

SUMMARY OF TREATMENT OF OVARIAN TUMOURS

At the time of labour, tumours of the ovary should be treated as conservatively as possible. It is often possible to push up ovarian tumours, cystic or solid, above the brim of the pelvis and allow labour to continue. If, however, the tumour is definitely obstructing labour, treatment depends upon whether one is dealing with a clean or suspect case.

In clean cases two methods are available:—

(1) The patient may be given a trial labour to see if the ovarian tumour can be pushed out of the way. If this is not successful abdominal section is performed, the ovarian tumour is removed and labour allowed to terminate through the natural passages.

(2) A Cæsarean section followed by an abdominal ovariectomy.

In suspect cases it may be possible to do an abdominal ovariectomy and deliver the foetus through the vaginal route. The alternative is to do an abdominal ovariectomy with a lower segment Cæsarean section.

The third method is vaginal ovariectomy or vaginal tapping through Douglas' pouch, but the latter is done only as an emergency measure.

If an ovarian cyst is left alone during labour the patient should be watched carefully during the puerperium for any signs of twisting, infection, etc., and if necessary an abdominal section is performed during the puerperium.

CANCER COMPLICATING PREGNANCY

The commonest site of cancer of the generative tract complicating pregnancy is the cervix.

The increased vascularity and softness of the cervix during pregnancy lead to a very rapid growth and spread of the cancer; usually pregnancy occurs in a uterus already the seat of a malignant cervical neoplasm, and it is rare for cancer to occur after conception. It is occasionally said to favour placenta prævia.

During labour it may cause obstruction due either to rigidity of the cervix or the presence of the tumour; hæmorrhage may be very profuse as the result of extensive tears which may be produced, and severe infection may occur during the puerperium because of the proximity of a sloughing malignant focus to the placental site.

Diagnosis is fairly simple, there being an indurated ulcer which bleeds freely on examination. In doubtful cases a piece of cervix must be sent for histo-pathological examination.

Treatment will depend upon the stage of the cancerous growth and the period of pregnancy at which the patient first comes under

observation. Depending upon these two factors the case may be classified under one of four groups :—

- (1) Cases of cancer at an early stage with early pregnancy.
- (2) Advanced cancer of the cervix with early pregnancy.
- (3) Cases of cancer at an early stage, with pregnancy advanced to thirty-two weeks or over (child viable).
- (4) Advanced cancer of the cervix in the later weeks of pregnancy.

(1) *Cancer with Early Pregnancy.* Two courses are open in such cases :—

(i) Radical treatment by operative methods with the termination of pregnancy, by Wertheim's operation.

(ii) Radium therapy, with or without abdominal hysterotomy. It is a moot point whether abdominal hysterotomy should be done as a preliminary to radium treatment. The advantages claimed are that the introduction of radium into the cervical canal may lead to abortion; and if it does occur the subsequent risks of uterine sepsis are obvious. Occasionally, even if abortion does not occur and pregnancy progresses, the effect of radium on the foetus must be considered. It has now been shown that radium has got an adverse effect on the growing ovum and that foetal development may be arrested or defective development of the brain may result leading later to congenital idiocy. From this point of view, therefore, it would appear that a hysterotomy, or even better a supravaginal hysterectomy, so as to remove the placental site and further reduce the chance of sepsis, is much the better line of treatment to adopt before radium therapy.

(2) *In advanced cases of cancer cervix complicating pregnancy in the early weeks*, radium treatment combined with deep X-ray therapy is the only method available. In such cases it is desirable to perform a supravaginal hysterectomy so as to minimise the chances of infection of the uterine cavity from the necrotic and infected malignant cervix. It is no use considering the possibility of getting a live child, as by the time the pregnancy can advance to this stage the woman's condition would have so deteriorated that she will have lost any chance of surviving. Apart from this consideration the associated risks and pain necessitate early treatment of the cancer and make it safe to terminate the pregnancy.

(3) *Early Cancer and Late Pregnancy.* When cancer is recognised in the later weeks of pregnancy the question naturally arises whether it may not be possible to temporise for a short time, so that the child is not merely viable but capable of being reared after

delivery. This decision will depend upon the condition of the cancer and the possibility of keeping the patient under observation. Consistent with this policy treatment may be delayed a few weeks. The treatment most to be favoured is radium therapy. If the foetus is presenting by the cephalic pole it is better to convert it into a podalic presentation before the application of radium. The effects of radium would not then be felt on the cephalic pole and the consequent atrophy or interference with the development of the brain of the foetus would not occur. After the application of radium labour should always be terminated by the abdominal route.

The question of a radical operation may also have to be considered at the same time.

(4) *In advanced cases of cancer observed in the later weeks of pregnancy* radium therapy is the only method of treatment. Provided the precautions mentioned above are taken, it is better to apply radium as soon as possible so as to lessen the chances of sudden hæmorrhage and the risk of infection. Pregnancy should always be terminated by the abdominal route, and it is preferable because of the infection present in the cervix to perform a supra-vaginal hysterectomy after Cæsarean section.

It may be stated here that the position with regard to the methods of treatment of cervical cancer has undergone a remarkable change in recent years because of the more extended use of radium and deep X-ray therapy. It is now felt by most gynæcologists that equally good results are obtained by radiation therapy and without the serious risks associated with a radical operation. When radium is used in the early weeks of pregnancy, however, it is well known that there is considerable risk of causing serious developmental defects in the foetus, and because of this evacuation of the uterus before radiation, in early pregnancy, is fully justified. Irradiation late in pregnancy does not apparently carry with it so grave a risk to the child, particularly if the precaution is taken of converting the presentation to a breech before the application of radium.

Intimately associated with this question is that of possible dangers to the future offspring by preconceptional irradiation. At present radium is extensively used for conditions such as metropathia hæmorrhagica and fibroids, and occasionally pregnancy does follow such treatment. The following general considerations may be borne in mind when preconceptional irradiation is resorted to :—

(1) Pregnancy following preconceptional irradiation for metropathia hæmorrhagica, fibroid tumours or for temporary sterilisation proceeds normally, and with few exceptions parturition is normal. When, however, a stenosed fibrotic cervix is likely to cause obstruction Cæsarean section should be performed.

(2) There is no definite evidence of preconceptional radium therapy affecting the child.

Cancer of the body of the uterus complicating pregnancy is extremely rare, and when it does occur the chances are that abortion will result.

Cancer of the vagina or the vulval outlet may sometimes complicate pregnancy. The treatment adopted should be to deal with the cancer at as early a stage as possible by radium therapy and to terminate the pregnancy by the abdominal route.

Cancer complicating the Puerperium. When a patient with cancer of the cervix or of the lower genital tract has been delivered through the natural passages, every effort should be made to try and prevent the spread of infection to the uterus.

CHAPTER XXXVII

CONTRACTED PELVIS

In a contracted pelvis one or other of the diameters in one or other of the planes is shorter than normal. The contraction may be at the brim of the pelvis or at the outlet, or the brim, cavity and the outlet may all be involved. The contraction may also be symmetrical or asymmetrical and so cause several varieties of deformity.

It is not possible to state definitely what constitutes a normal pelvis, for it depends upon several factors and varies in different countries. It is therefore wiser to lay down standards for particular countries and communities, rather than adopt a uniform standard for all. What may be styled a normal pelvis in some of the European countries differs from the Indian standard; and this in turn differs from the standard of the inhabitants of Africa. Jewish women are said to have a relatively small pelvis. Taking these facts into consideration, it may be stated that deviations in size or shape from the normal standard of each country or race constitutes a contraction of the pelvis.

Classification

The most common method of classifying contracted pelvis is according to the ætiology and pathology. There are some well-known systems of classification which are recognised generally by obstetricians. Of these the important ones are:—

- (1) Litzmann's classification.
- (2) Schauta's classification.
- (3) Jellet's classification.

1. LITZMANN'S CLASSIFI

I. Pelvis of normal shape, but either a contracted pelvis).

II. Pelvis with abnormal shape.

(a) Flat pelvis.

(1) Simple.

(2) Rachitic.

(3) Generally contracted

(b) Transversely contracted pelvis

(c) Irregularly contracted pelvis

(1) Scoliosis.

(2) Coxalgia.

(3) Amputation of leg.

(4) Dislocation of femur.

(5) Asymmetric sacrum

(d) Crushed pelvis, the osteomalacic pelvis.

2. SCHAUTA'S CLASSIFI

I. The results of developmental anomalies

(1) Generally contracted, not

(a) Infantile pelvis.

(b) Masculine pelvis.

(c) Dwarf pelvis.

(2) Simple flat, not rachitic, pelvis

(3) Generally contracted flat, pelvis

(4) Funnel-shaped pelvis, foetal

(5) Insufficient development of pelvis (Naegele).

(6) Insufficient development of pelvis (Robert).

(7) The generally too large pelvis

(8) The split pelvis. Absence of pubis.

II. Anomalies, the result of diseases

(1) Rachitis.

(2) Osteomalacia.

(3) Neoplasms.

(4) Fracture.

(5) Atrophy, caries and necro

III. Anomalies of the pelvic joints.

- (a) Synostosis of one or more.
- (b) Softening of one or more.

IV. Anomalies caused by diseases of the trunk.

- (1) Spondylolisthesis.
- (2) Kyphosis.
- (3) Scoliosis.
- (4) Kyphoscoliosis.
- (5) Assimilation.

V. Anomalies, the result of diseases of the supports of the pelvis.

- (1) Coxitis.
- (2) Dislocation of one or both femora.
- (3) Club-foot.
- (4) Absence or inefficiency of one or both legs.

3. JELLETT'S CLASSIFICATION

We prefer the classification adopted by Jellett which is simple and practical. The classification of Jellett is here given—

A. Generally contracted pelvis.

- (1) Generally contracted.
 - (a) Non-rachitic.
 - (b) Rachitic.
- (2) Dwarf pelvis.

B. Flattened pelvis:

- (1) Flat pelvis.
 - (a) Non-rachitic.
 - (b) Rachitic.
- (2) Generally contracted, flat pelvis.
 - (a) Non-rachitic.
 - (b) Rachitic.
- (3) Pelvis of congenital dislocation of the hip.

C. Obliquely distorted pelvis.

- (1) By spinal curvature—kyphoscoliotic.
- (2) By imperfect or abolished use of one limb—coxalgic pelvis.
- (3) By asymmetry of the sacrum—unilateral, synostotic pelvis—Naegele's pelvis.

D. Transversely contracted pelvis.

The bilateral synostotic (or Robert's) pelvis.

E. Funnel-shaped pelvis.

- (1) Developmental.
- (2) Kyphotic.

F. Compressed or triradiate pelvis.

- (1) Rachitic.
- (2) Osteomalacic.

G. Roofed pelvis.

- (1) Spondylolisthetic.
- (2) Kyphotic.

*H. Pelvis narrowed by fractures, ossifications or tumours.**I. Split pelvis.*

No perfect scheme of classification is possible in the present stage of our knowledge, but there are various factors which are responsible for the causation of contracted pelvis which should be borne in mind. Amongst such factors are :—

Congenital Deformities. A large number of congenital deformities are responsible for the causation of contracted pelvis. Among these may be mentioned :—

- (a) The infantile type.
- (b) Insufficient development of one or both wings of the sacrum.
- (c) Absence of closure of the symphysis pubis.
- (d) Assimilation of the lumbar with the sacral vertebrae.
- (e) Congenital dislocation of the hip-joint.
- (f) Clubfoot and deformities of one or both legs and absence or inefficiency of one or both legs, resulting in short stature.

Diseased conditions, which may be responsible for the production of a contracted pelvis, are :—

- (a) Rickets.
- (b) Tubercular diseases of the hip-joint or sacro-iliac joint or the spinal column.
- (c) Deformities of the spinal column due to other causes.
- (d) Osteomalacia.

- (e) Fractures of the pelvis or of the lower extremities resulting in malunion.
- (f) Caries and necrosis.
- (g) New growths.

FREQUENCY

The frequency of contracted pelvis is variously estimated by observers in different countries. This is possibly due to the lack of a definite standard being available for classifying contracted pelvises; the greater incidence of certain ætiological factors such as rickets and osteomalacia in some countries naturally leads to the more frequent occurrence of contracted pelvises in such countries.

Even in India the proportion of major degrees of contracted pelvis is less in Southern India than in parts of Northern India, where osteomalacia is much more frequently met with.

The commoner varieties of contracted pelvises are :—

- (1) The generally contracted pelvis (the small gynæcoid).
- (2) The flat pelvis (Platypelloid).
- (3) The generally contracted and flat pelvis (small Gynæcoid and Platypelloid).

Others less frequently encountered are the funnel-shaped pelvis (Android) the triradiate pelvis (Osteomalacic) and the obliquely distorted pelvis (Naegele's).

Diagnosis of Contracted Pelvis

The importance of diagnosing the existence of a contracted pelvis before the onset of labour must be clearly realised. With this end in view, careful pelvic measurements must be taken in every case where the woman is pregnant for the first time, and in all cases where a history of previous difficult labour is elicited. The following points require consideration.

History. The history of early infancy is always useful, as any evidence of rickets at this period must indicate to the practitioner the possibility of some degree of rachitic deformity being present. In the later period a history of any disease such as tuberculosis affecting the joints, or any trauma leading to fracture of the pelvis, femora or any other bone of the lower extremity may suggest deformity.

During pregnancy any history which suggests the signs and symptoms of osteomalacia should be carefully noted; this disease

is far more common at the time of pregnancy and leads to a typical deformity if left untreated.

The history of previous deliveries is most valuable and should always be carefully elicited. It is necessary to note whether the delivery was at full term, whether it was spontaneous or assisted, whether the child was born alive or dead, or was difficult to resuscitate and whether the child died in the neonatal period.

A history of assisted delivery is of great value, particularly if the details are available as to the indications for and nature of the aid given.

Because of this, it should be considered the duty of every obstetrician who attends at a difficult labour to give a concise report of the nature of delivery indicating the reason for interference and the particular difficulty that was experienced. The mother should be instructed to show this report to the obstetrician who attends at her next delivery. At no time is it possible to arrive at a more satisfactory opinion regarding the type and degree of contraction of the pelvis and its influence on the passage of the foetus than at the time of labour, and it is most unfortunate if such valuable information, gained, often at considerable risk to both mother and child, is not made available at a subsequent delivery. We would commend this matter to the attention of all obstetricians called upon to attend on a case of difficult labour.

When there is a history of a destructive operation being necessary it indicates a serious degree of disproportion. It is a rule that whenever we have dealt with a case of serious disproportion, we not only give particulars of the difficulty that we had to negotiate but add what, in our opinion, would constitute the most favourable method of delivery should the patient again become pregnant. This seems to be the only logical method to adopt, and it is for the next attendant to decide how far the advice offered can, under the circumstances, be utilised at the subsequent delivery.

Per contra, it is equally useful to record a negative history of no disproportion or pelvic deformity. It must, however, be stated that this is of limited value, in view of the fact that between two deliveries, conditions may occur resulting in the production of a degree of deformity of the pelvis which may give rise to dystocia. Thus, in fractures of the pelvis, as a result of accident, growth of tumours, and in the development of certain diseases like tuberculosis or osteomalacia, deformities may result which can cause dystocia in subsequent labours although previously there was no such difficulty.

Appearance and Gait. The general appearance of the patient and the gait assumed by her very often suggest the possibilities of pelvic deformity. It is essential that the patient be stripped and examined in a good light and her gait carefully watched. Small stature, pendulous abdomen, deformities of the spine, shortness of one or other of the extremities, obvious tilting of the pelvis, bow-legs, genu valgum, club-feet, or a relative disproportion between the upper half of the body and the lower half, as in cases of achondroplastic dwarfs, and a waddling gait, would all suggest pelvic deformity. Other evidence of rickets must also be looked for, such as a rickety rosary, deformities of the chest, obvious curvature of bones,



FIG. 145.—Pendulous abdomen, etc.
in a gravid woman.

Abdominal Examination. Having noted the general appearance of the patient, she should be made to lie flat on a couch and the abdomen examined. Undue prominence of the abdomen, uterine obliquity and abnormal elongation of the uterus transversely should all be looked for. Abdominal palpation, if the woman is at or near full term, gives useful information relative to the presence or absence of a contracted pelvis. Malpresentations or malpositions of the foetus, non-engagement of the head in primiparae, particularly during labour at full term, and overriding of the symphysis pubis by the foetal head, are all indicative of disproportion which may be due to pelvic contraction.

Examination of the Pelvis. Pelvimetry is by far the most certain method of diagnosing contracted pelvis. Accordingly in all cases, especially where there is a suspicion of contraction, and in every primigravida, pelvic measurements should invariably be taken and recorded. These are grouped as *external* measurements and *internal* measurements.

External Pelvimetry. This is done by using a pelvimeter such as that devised by Matthews Duncan, or Martin, or Budin. The external pelvic measurements of obstetrical importance are seven. They are:—

- (1) The *interspinous diameter*, which is the distance between the outer borders of the anterior superior iliac spines.

- (2) The *intercristal diameter*, which is the distance between the most distant portions of the outer borders of the iliac crests.
- (3) The *external conjugate*, or *Baudelocque's diameter*, which extends from the depression just beneath the spinous process of the last lumbar vertebra to the anterior surface of the symphysis pubis.
- (4) The *transverse diameter of the outlet*, which is the distance between the two ischial tuberosities.
- (5) The *anteroposterior diameter of the outlet*, which is the distance between the under surface of the symphysis pubis and the tip of the sacrum.
- (6) The *distance between the posterior superior iliac spines*.
- (7) The *distance between the femoral trochanters*.

When the pelvis is to be measured externally, the patient should be made to lie perfectly flat and straight with her abdomen and hips exposed, or covered only by a very thin piece of cloth. The pelvimeter is held by the free ends of the arms between the thumb and index finger of each hand and brought in contact with the various anatomical bony points and pressed against them fairly firmly.

In taking the interspinous diameter, the outer edges of the anterior superior spines are first noted and the tips of the pelvimeter pressed against them.

In measuring the intercristal diameter, the most widely separated points are located and the tips applied to the outer lip of the ridge. It is necessary to note this, as both at the crests of the ilium as well as at the superior spines, the bones present an outer and an inner lip with an intermediate ridge, so that if the inner lips are taken a difference of 1 to 1.5 centimetres between the outer and the inner measurements may result.

The measurement of the external conjugate may present difficulties in fat women. This is due to the difficulty experienced in locating exactly the point on the dorsum of the trunk to which the pelvimeter has to be applied. In most cases the spinous process of the last lumbar vertebra can be easily made out, and the depression just below the spine is the point from which the measurement has to be taken. A second method of arriving at this point is by taking the superior angle of Michaeli's rhomboid, whose upper and

lower margins are formed by the sacrospinalis and gluteus muscles respectively. A third method of locating this particular point is to

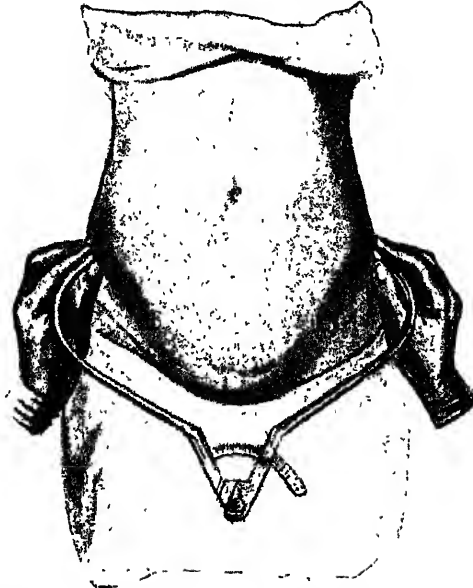


FIG. 146.—External pelvimetry. Method of measuring the interspinous diameter.



FIG. 147.—Michaelis' rhomboid.

take a point one inch above the line joining the posterior superior iliac spines.

In ascertaining the intertrochanteric diameter the most prominent points of the trochanters are carefully located and the tips of the pelvimeter then pressed firmly against them, so that they come in as intimate contact with the bone as possible.

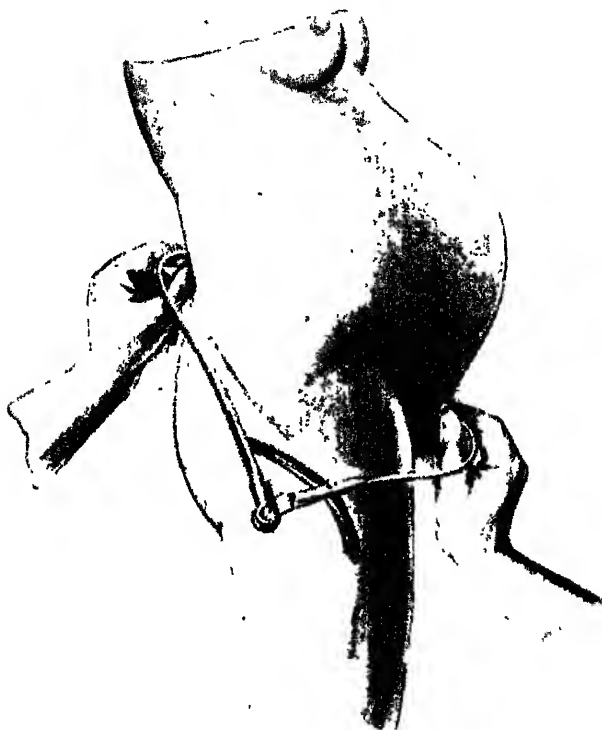


FIG. 148.—External pelvimetry. Method of measuring the external conjugate diameter.

Average Normal Measurements. The following are the average measurements :—

Interspinous diameter	10½ inches
Intercristal diameter	11½ "
External conjugate	8 "
Intertrochanteric diameter	12½ "
Posterior superior iliac spines	3½ "
Anteroposterior diameter of the outlet	4½ "

It may be stated that so far as South Indian women are concerned, the measurements are fully one inch less than those recorded as average measurements for the interspinous, intertrochanteric,

e diameters. Thus, if a woman has a pelvis asurements—

iameter	.	.	.	9½ to 10 inches
iameter	.	.	.	10½ " 11 "
onjugate	.	.	.	7 " 7½ "

these measurements are average and do not

elvic measurements noted above will enable of cases to determine whether the pelvis is the variety of contraction.

contracted Pelvis. In this variety all the portionately reduced. As an illustration we measurements are—

iameter	.	.	.	8½ inches
iameter	.	.	.	9½ "
onjugate	.	.	.	6½ "

of the generally contracted variety.

Here the usual proportion between the interinous diameters is not maintained. Generally f at least one inch between these two, but in educed sometimes by half an inch or more. would therefore be:—

iameter	.	.	.	9½ inches
iameter	.	.	.	10 "
onjugate	.	.	.	6¾ "

contracted and Flat Pelvis. In this not only n all the measurements, but the proportion al and the interspinous diameters of a normal ed. Thus the measurements may be:—

iameter	.	.	.	8½ inches
iameter	.	.	.	9 "
onjugate	.	.	.	6¾ "

d Pelvis. If the measurements of the outlet measurements at the brim of the pelvis, as intercrystal, interspinous and the external or less normal, it is suggestive of a funnel— may be either a transversely contracted or an anteroposteriorly contracted funneling upon whether the transverse diameter is posterior diameter is reduced.

PATHOLOGY OF LABOUR

(5) If the distance between the posterior superior iliac spines, which is normally $3\frac{1}{2}$ inches, is diminished, one of two varieties of contraction may be present:—

- (a) Obliquely distorted pelvis (Naegle's pelvis).
- (b) Transversely contracted pelvis (Robert's pelvis).

A simple method of differentiating between these two types of contracted pelvis is to take the distance between the mid-point of the spinal column and each of the posterior superior spines. If the diminution is due to an equal reduction in this distance on either side we are dealing with a transversely contracted pelvis or Robert's pelvis. If, on the other hand, the distance is more diminished on one side than on the other the type of pelvis is an obliquely distorted one. The proportion between the inter-trochanteric diameter and the distance between the posterior superior iliac spines is usually $3\frac{1}{2} : 1$; but if this is increased it suggests a diminution of the distance between the posterior superior spines, and thus the possibility of a Naegle's or Robert's pelvis.

Other measurements bearing upon these types of pelvis will be described later, when these varieties are being discussed in more detail.

External pelvimetry thus gives a fair idea as to the presence or absence of contraction of the pelvis, and in certain types of contraction it enables us to come to a conclusion as to the nature of the contraction.

Internal Pelvimetry. The external pelvic measurements are, however, useful only as a rough guide as to the nature of the pelvis. There are, certain conditions where external measurements do not give us an accurate idea of the pelvis. Thus the thickness of the bones, the inclination of the symphysis pubis, the nature of the subpubic angle, the prominence of the sacral promontory, the prominence of the ischial spines, the curvature of the ilio-pectineal line, the depth and size of the sacrosciatic notch and the sloping of the pelvis in general are factors which materially affect the character of the pelvic cavity. From this point of view, therefore, external measurements alone do not help us in arriving at a final conclusion. We must therefore clearly realise the limitations of external pelvic measurements, and it is this that has suggested to obstetricians the need for obtaining more reliable information by internal pelvimetry combined with pelvic examination *per vaginam* about the 36th week of pregnancy.

Two methods of internal pelvimetry are employed to estimate diameters :—

- (1) By instruments.
- (2) By digital or manual examination.

(1) *By the Use of Instruments.* Various types of internal pelvimeters have been devised. The best known is perhaps Skutsch's pelvimeter. This instrument consists of a rigid, curvilinear rod and a flexible limb adjustable round a semicircular plane. After sterilising the instrument, the rigid limb is passed inside the vaginal cavity and adjusted against a particular point, while the flexible limb is adjusted to a point outside. Thus, in arriving at the measurement of the true conjugate, the rigid limb guided by the fingers in the vagina is first applied to the sacral promontory, the flexible limb being adjusted on the anterior surface of the symphysis pubis. The two limbs are steadied by screws; the instrument is then removed and the distance between the two points read on a scale. The instrument is now reintroduced with the curvature of the rigid limb pointing forward, and is applied to the most prominent point on the posterior surface of the symphysis pubis. The flexible limb is applied to the same point on the anterior surface as before; the limbs are flexed and the instrument taken out and

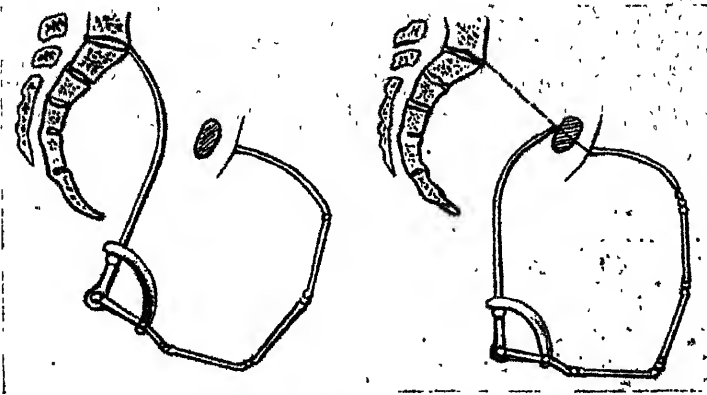


FIG. 149.—Internal pelvimetry. Method of measuring the true conjugate by Skutsch's instrument.

the distance between the two points read on the graduated scale. The difference between the two readings gives the actual measurement of the true conjugate.

In a similar manner the transverse diameter of the pelvis may also be measured.

There are other instruments which have been devised to measure directly the true conjugate. In most of these cases the instruments are so used that one limb can be applied on to the sacral promontory, the other to the most prominent point on the undersurface of the symphysis pubis.

(2) *Digital Method.* The obstetrical conjugate can be deduced from the measurement of the diagonal conjugate.

To measure the Diagonal Conjugate. The patient is put in the lithotomy position, the external genitalia cleansed, and with all aseptic precautions the middle and forefinger of the right hand are passed into the vagina until the tip of the middle finger impinges on the sacral promontory and the radial surface of the index finger is pressed against the undersurface of the symphysis

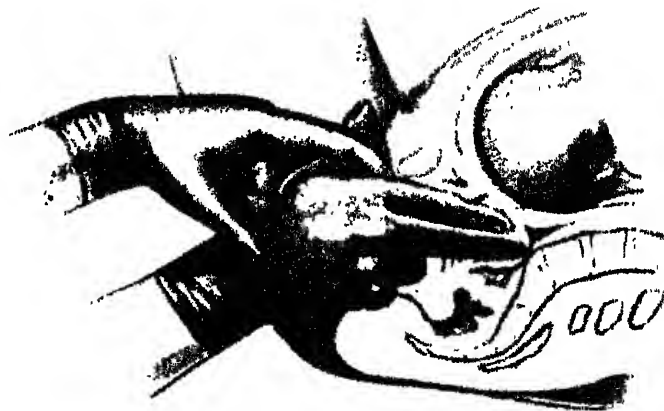


Fig. 150.—Internal pelvimetry. Method of measuring the diagonal conjugate

pubis. With the index finger of the other hand, the point of contact of the index finger in the vagina with the lower margin of the symphysis pubis is marked off; both fingers are then withdrawn, and the distance between the tip of the middle finger on the point marked on the forefinger measured with calipers. This gives the length of the diagonal conjugate, and the true conjugate is estimated by deducting about $\frac{1}{2}$ to $\frac{3}{4}$ in. from this measurement depending upon the height and inclination of the symphysis pubis.

Another method of measuring the true conjugate is by the introduction of the whole hand inside the vagina and measuring the true conjugate by pressing the little finger against the sacral promontory, while the thumb is extended sufficiently to meet the undersurface of the symphysis pubis. The hand is then removed and stretched in the same position as in the vagina and it

measurement taken by means of calipers. This method of measurement is practicable only after delivery and cannot ordinarily be

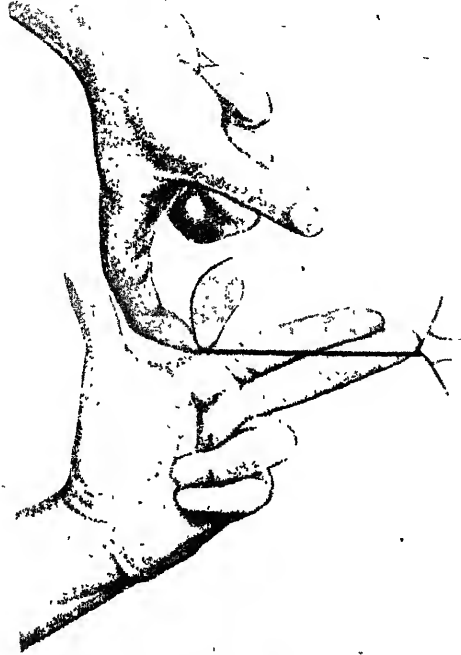


FIG. 151.—Internal pelvimetry. Method of measuring the diagonal conjugate: schematic.

applied where the measurement has to be ascertained during pregnancy or labour.

Lastly, we must emphasise this fact, that external and internal pelvimetry are only useful as guides to the diagnosis of pelvic contraction, thereby helping us at arriving at the fundamental question whether there is disproportion between the presenting part and the pelvis in any given case. The most essential point for final consideration is therefore not one of the pelvic measurements but one of the relative size of the foetal head and the maternal pelvis. Hence the truth of the statement made by Barbour that the best pelvimeter in the practice of obstetrics is the foetal head, must never be forgotten. Pelvic examination must, in all doubtful cases, be done about the 36th week of pregnancy. Besides finding out the degree of disproportion, if any, between the cephalic pole of the foetus and the brim of the pelvis, it is also necessary to study the pelvis in detail and note important points such as the prominence of the sacral promontory and how easily it is felt, the width

and depth of the sacrosciatic notch, the ischial spines, the slope of the pelvic wall, pectineal lines, any irregularity in the shape of the cavity, thickness of the muscles, presence of bony abnormalities, the nature of the subpubic angle, obtuse and also the other diameters of the pelvis throw much light as to the possibility of the fetus passing through the cavity easily and being delivered without difficulty.

Radiographic Examination. In recent years much has been made to determine the nature of the pelvis by the use of radiography. It is under the recognition of certain types of deformed pelvis, Robert's pelvis, split pelvis and congenital bony growths. Methods have been recently devised for measuring the degree of contraction in cases of flat pelvises. Stereoscopic pictures, as well as the use of X-ray sheets, have been tried; but much work has to be done to enable us to judge with any degree of accuracy from a radiograph alone, the extent of cephalo-pelvic disproportion in a particular case and to judge of the mode of delivery. It may however be stated that to judge of the size of the pelvis and the presence of cephalo-pelvic disproportion the best guide still remains to be the foetal head in the pelvis and the information gained by a pelvic examination for the cavity and outlet of the pelvis.

CHAPTER XXXV

THE COURSE OF PREGNANCY IN A CONTRACTED PELVIS

During Pregnancy. The effect of a contracted pelvis on pregnancy may be noted in some cases in which there is an increased tendency for a retroverted foetus to become incarcerated. This is more likely to occur where the sacral promontory or the mechanical obstruction to the free development of the foetus upwards into the abdominal cavity.

In the later weeks of pregnancy the foetus may produce overdistension of the abdominal wall to accommodate any part of the foetus. The foetus may fall forward, resulting in the condition of

increased pressure of the gravid uterus on the diaphragm and the thorax may cause difficulty in respiration and cardiac distress. Since the pelvis does not allow any part of the foetus to descend and tends to push the whole of the gravid uterus upwards into the abdominal cavity, the height of the fundus may not correspond to the period of amenorrhoea. There is an increased tendency for malpresentations and unfavourable attitudes of the foetus to occur and these later lead to dystocia.

During Labour. The effect of contracted pelvis on labour depends upon the nature and degree of contraction and upon the relative disproportion between the presenting part and the pelvis. In some cases it may not be possible for any progress to take place. In others labour is prolonged, but may terminate either spontaneously or with artificial assistance and results in the delivery of a living or a still-born child. Abnormal presentations such as breech, face, brow, shoulder and occipito-posterior positions are relatively more frequent with contracted pelvises. Premature rupture of membranes, favouring prolapse of the umbilical cord or a part of the foetus, like the arm or the foot, is also common. This is due to the fact that the presenting part cannot fill the lower uterine segment and fit comfortably into the brim of the pelvis, resulting in a free communication between the forewaters and the afterwaters. The bag of membranes tends to protrude in a cone-shaped manner and the pressure in the fluid is so great that the membranes are likely to rupture prematurely. The gush of liquor amnii forces down the cord or occasionally the hand or foot of the foetus. Premature rupture of the membranes, together with failure of the presenting part to fit in the lower uterine segment results in slow and imperfect dilatation of the cervix. The cervical lips may not be taken up but hang down loose and fringe-like. The gradual drainage of liquor amnii, the associated ineffective contractions of the uterus, and the increased resistance offered to the presenting part in its attempts to descend, all lead to a prolongation of the first stage. The anterior lip of the cervix may be compressed between the symphysis pubis and the presenting part, and becoming oedematous still further narrows the cervical canal and prevents the further dilatation of the cervical os. It would appear that in such cases a vicious circle is set up, leading to a failure of the cervix to respond to uterine polarity thus causing increased delay. The uterine contractions may also be at fault, being either ineffective and sluggish from the beginning or passing into uterine exhaustion before labour is over. In other cases, as a result of prolonged labour, the contractions of the uterus become tetanic and may ultimately

lead to rupture of the uterus if the obstruction cannot be overcome. The continued contractions of the uterus lead to increased dilatation of the lower uterine segment, the walls of which become more and more stretched and dangerously thinned-out so that rupture results. Such a condition of tetanic contraction requires immediate relief, as otherwise rupture is bound to occur. The danger of traumatic rupture in such cases should be borne in mind, and great caution exercised in the course of delivery so as to avoid precipitating such a catastrophe by unskilful or ill-timed intra-uterine manœuvres.

Effect on Soft Parts. The prolongation of the stages of labour, the continued pressure of the cephalic pole on the soft parts, and the consequent interference with the free circulation of blood, may lead to a pressure-necrosis which is followed by sloughing and fistula formation when sloughs separate. Such fistulae are more common between the bladder and the vaginal canal, but they may also occur between the rectum and the vagina. The increased compression of the soft parts also renders them more liable to infection. Where the head undergoes extreme moulding and a large caput is formed, the pressure exerted may lead to œdema of the perineum and the surrounding area, and in such cases tears of the perineum are inevitable and they do not unite by first intention when sutured.

Effect on Joints and Bones. The increased pressure of the presenting part may lead in some cases to subluxation of the joints, and in others where delivery is effected with some amount of force, to spontaneous rupture of the symphysis pubis or of one or both sacro-iliac joints, and at the outlet fracture of the coccyx or subluxation of the sacro-coccygeal joint may occur. These may lead later on to a great deal of disability due to defective gait, severe pain in the joints and coccydynia.

Effect of Labour on the Fœtus. Usually the fœtus does not suffer from any bad effects so long as the membranes are intact. This statement, however, requires to be qualified, as sometimes symptoms of fœtal distress may manifest themselves and occasionally the fœtus may be born dead immediately after the membranes have ruptured. There are two obvious reasons for such an unfortunate result. In some cases the amount of liquor amnii may not be sufficient to protect the fœtus from the severity of the uterine contractions. It may not be sufficiently marked to be termed an oligohydramnios, but a relative diminution of the total quantity of liquor amnii can cause fœtal distress in the first stage of labour.

The other and perhaps more important reason, particularly in cases of contracted pelvis, is that occasionally in primiparæ the head may mould and by the vigorous contractions of the uterus be forced into the pelvic cavity, the bag of membranes being intact but small. The undue prolongation of the first stage of labour in such cases has virtually the same effect upon the foetus, as a prolonged second stage with the head in the cavity. The continued compression of the foetal head in the pelvic cavity is likely to lead to increased intracranial stress with hæmorrhage from tearing of the tentorium cerebelli or falx cerebri.

After rupture of the membranes, the prolonged uterine contractions exert a deleterious influence upon the foetus by interfering with the placental circulation, by the prolonged pressure exerted upon the head, resulting in excessive moulding and the formation of a large caput. The child may thus be asphyxiated or suffer from intracranial injuries leading to still-birth, asphyxia neonatorum or death during the neonatal period. The greater frequency of prolapse of the cord has already been referred to, and as this condition occurs with imperfect dilatation of the os, the risks to the foetus are obvious. The degree of obstruction that the foetal head has to overcome in its progress through a contracted pelvis determines the extent of damage that may be sustained. Among such foetal injuries are pressure marks on the scalp, spoon-shaped deformities and depressed fractures of the skull, and various intracranial injuries which have been referred to already. Such pressure effects are felt by the vital centres, particularly the respiratory centre, giving rise to a deep degree of asphyxia at birth. The child may in those circumstances be revived with considerable difficulty, yet may not survive the neonatal period. It is not unusual to observe that while the foetal heart-beats persist for a time, no attempts at respiration can be provoked.

Prognosis of Labour in Contracted Pelvis

From what has been stated above, it will be obvious that the outlook for both mother and child is serious unless adequate treatment can be given at the proper time.

The Mother. The increased risks of rupture of the uterus, sepsis, exhaustion and shock, and other injuries to the genital tract make the prognosis for the mother very much more unfavourable. The risks to the mother depend upon :—

- (1) The nature and degree of contracted pelvis.

- (2) The presentation, position and relative disproportion of the head to the maternal pelvis.
- (3) The nature of the uterine contractions.
- (4) The presence or otherwise of complications, such as placenta prævia, eclampsia.
- (5) The stage at which the patient comes under observation in labour.
- (6) The operative methods of delivery adopted and the facilities available at the time of labour and during the puerperium for her proper care.

The Child. The prognosis is unfavourable even when labour ends spontaneously. If the pelvic contraction is of a high degree, the chances are perhaps better in view of the earlier recognition of the serious disproportion and adoption of abdominal modes of delivery. It is in the border-line degrees of contracted pelvis that the contraction may not be recognised and a great deal of judgment is required in selecting the proper method of treatment. It is here that the foetal prognosis will materially depend on the judgment, experience and calm outlook of the obstetrician in charge. Errors in judgment, hasty methods of operative delivery, or, on the other hand, delay in affording timely assistance in the vain hope that labour will perhaps terminate spontaneously, are all likely to increase the risks to the foetus. In the large majority of cases death of the foetus is due to asphyxia, the result of intracranial stress or interference with the placental circulation. There are many other injuries that are likely to occur in the course of delivery in a contracted pelvis, to which reference is made later.

CHAPTER XXXIX

MANAGEMENT OF LABOUR IN CONTRACTED PELVIS

No subject in the whole field of obstetrics presents a more difficult problem than the management of labour in a contracted pelvis. It is not surprising that with the methods of estimating disproportion that are at present available, there should be such difficulty and so much divergence of opinion as to what is the proper line to adopt in any given case. The difficulty is increased when deciding on a particular line of treatment in the presence of additional complications, such as premature rupture of the membranes, slow dilatation of the cervix, prolapse of the cord and malpresentations.

and malpositions. A point to be remembered and sufficient emphasis cannot be laid on it—is, that pelvimetry, cephalometry, and all methods of estimating relative disproportion, are useful only up to a certain limit. The question can never be answered with absolute certainty, whether a particular head will mould through a particular pelvis or whether the uterus will be able by effective contractions to push the head down without causing undue risk to the mother or child. It is because of these two factors that surprises sometimes occur, some of which are welcome, while others unfortunately are very distressing. Cases must be within the experience of most obstetricians where a definite diagnosis of disproportion has been made and the question of a Cæsarean section seriously considered, yet with good labour pains after rupture of membranes the head has passed the obstruction, and indeed the whole delivery has been completed. On the other hand, there are cases where the obstetrician was confident that the slight degree of disproportion would be easily overcome with strong uterine contractions; but either because of post-maturity or because of the relative hardness of the foetal skull, moulding has been inappreciable and little or no progress has been made after hours of waiting. While such difficulties must of necessity be recognised, it should be realised that with reasonable care and diligence it is possible to estimate with considerable accuracy the degree of disproportion, and the mode of delivery to be adopted in the great majority of cases.

We shall now consider the different forms of delivery that are applicable in cases of labour complicated by contracted pelves. We refer later to the particular forms of delivery that are most appropriate for the different types and degrees of contracted pelves.

Spontaneous Delivery

It has already been stated that in some cases of contracted pelvis spontaneous delivery can and does occur. In fact, in minor degrees of contraction, there is every possibility of delivery occurring spontaneously, though occasionally at the beginning of labour the non-engagement of the foetal head may give cause for some anxiety. It must be realised that in many of these cases, at the onset of labour, deflexion attitudes are present which get corrected when the uterus begins to contract more effectively and pushes the foetal head into the pelvic cavity. Undoubtedly occipito-anterior positions are more favourable to spontaneous delivery than occipito-posterior. It is the size and consistency of the foetal head, together

with the strength of the expulsive forces of delivery in these cases of minor disproportion.

Test Labour

It is because of a more clear realisation of spontaneous delivery in cases of minor disproportion that obstetricians now feel that there is a wider margin for safety as a "test labour." This procedure is adopted in cases of contracted pelvis. The woman is allowed to have good pains awaited with a view to see whether she can get through and be delivered spontaneously, or whether such as the application of forceps. The test is not complete till the woman has been some hours in labour, the uterine contractions have been present for some time, the membranes have ruptured and the child has descended. We do not suggest that the time for deciding whether test labour has been successful is too long, but we feel that the possibilities of the foetal head passing through the pelvis can really only be judged after the membranes have ruptured and when the expulsive forces are fully tested. The question of whether a test labour is successful or not does not depend upon spontaneous delivery. Even in those cases where artificial aid is required, delivery can be effected through the vaginal route, and if the mother and child, test labour has succeeded. The test labour helps being necessary in a large number of cases where the uterus does effectively promote the passage of the child through the pelvic canal it may not succeed in expelling the child. Some degree of inertia may have developed and strong uterine contractions. Again, during the test labour distress may manifest themselves and necessitate the use of forceps in the interests of the child. In such cases, when the head has been moulded and the shoulders are in the cavity, completes the labour, but

What should constitute a Failure of Test Labour?
Failure of test labour is constituted by full dilatation of the cervix and rupture of the membranes, presence of strong uterine contractions throughout the labour, the brim of the pelvis, and there is no evidence that the head is still high and has only partially descended into the pelvis and can be easily dislodged, to have failed in so far as it indicates the possibility of delivery of a live child. In such cases it

the test labour, nor is it justifiable to attempt delivery through the vaginal route by the application of high forceps to a head that is virtually floating. The only alternative is delivery by the abdominal route, that is, by lower segment Cæsarean section.

We should like to emphasise that a lower segment Cæsarean section is not a commonly used method of completing labour when the woman has been submitted to test labour, but it is sometimes a necessity and must be adopted to save the foetus. The increased risks of an operation, after the woman has been subjected to several hours of labour, with probably more than one vaginal examination, are obvious when compared with elective Cæsarean section. The impression should not be that a test labour has succeeded because a child has been delivered alive by a lower segment section done at a late stage of labour. If the obstetrician would therefore keep in view the limitations under which test labour can be conducted; if he realises that it is not a method of treatment to be adopted for every case of contracted pelvis, in the vain hope that somehow or other the head may eventually go through, or alternatively, that he may be able to deliver it at a later stage by a lower segment Cæsarean section, test labour will be found to be remarkably useful and will save women from unnecessary and too frequent resort to abdominal methods of delivery. We are convinced of the great possibilities of test labour in the majority of cases of border-line disproportion. We only sound a note of warning against its indiscriminate use, without a full realisation of its risks and limitations. Trial labour is primarily an institutional procedure where there are trained personale to follow the course of labour and decide whether the trial is to be continued or the labour terminated by suitable operative interference. Continuous, careful and critical observation is essential in the management of trial labour. The ideally suited case for trial labour is one where the cephalo-pelvic disproportion is of a minor degree, the patient is full term, presentation vertex with full flexion and in anterior position, the patient herself intelligent and co-operating with the obstetrician. Post-maturity and occipito-posterior position with inertia and premature rupture of membranes may very often militate against a successful trial labour.

The method of conducting a trial labour is as follows:—On getting into labour, the patient is admitted into the Hospital and after the preliminary preparation, she is examined abdominally to make sure of the presentation, position and the degree of disproportion. If these are satisfactory, the labour is allowed to

continue. A careful watch is kept over the patient and her temperature, pulse, nature of uterine contractions, the degree of descent of the presenting part into the pelvic brim and also the foetal heart rate are recorded at intervals. The patient is given sufficient nourishment and sedatives to conserve her strength during labour which has always a tendency to be prolonged. Not more than one vaginal examination is required in the majority of cases. This is preferably done after the patient has been in labour for some hours, the contractions are strong and coming on once in 4-5 minutes indicating the possibility of some degree of dilatation of the cervix. When an internal examination is done with all aseptic precautions, the nature of the perineum and outlet, the prominence of the ischial spines, the amount of space available in the cavity of the pelvis, etc., must all be noted if these have not been done at an earlier preliminary examination at about the 36th week of pregnancy. The most important information to obtain is the nature of the cervix, its close application to the bag of membranes which will be full, round and watch glass shaped. Invariably in such cases, the head behind will get engaged in a synclitic manner and will descend rapidly soon after the rupture of membranes and delivery will take place by natural powers. If on the other hand, the vaginal examination reveals a hard and non-dilating cervix, a bag of membranes loose and glove shaped protruding through the cervical os or one where the membranes have already ruptured, the presenting part high up and asynclitic in engagement or occipito-posterior in position, the chances are that the trial labour may not succeed and the ideal will be to do a caesarean section and deliver the child when the conditions are suitable. If the conditions are favourable for a successful trial labour as indicated by the presence of findings detailed above, the case can be left alone and all further observations made from abdominal examination above following the head down the pelvic brim and cavity. The labour in such cases progresses satisfactorily, the head descends after moulding, the cervix dilates fully and is retracted over the presenting part and the membranes rupture in time. The course of the delivery takes the usual time as when the head is fixed at the commencement of labour. If on the other hand, the membranes rupture after full dilatation of the cervix and still there is no attempt on the part of the head to descend in spite of 2 hours of strong uterine contractions, the case must be considered as a failed trial labour and a lower segment caesarean section done without further delay. The question of time is not so important a

criterion as the effect of the uterine contractions on the descent of the head and the foetal heart rate and the maternal pulse. If these are adversely affected there is no purpose in waiting and interference is indicated to terminate in 2nd stage of labour. At this period, another vaginal examination is needed to decide as to the mode of delivery in cases where the head has descended into the cavity but the further progress is delayed. If the head does not come down, lower segment caesarean section is the operation of choice. In other cases one of the methods of vaginal delivery will have to be decided upon as indicated by the conditions then present.

Induction of Labour

Induction of Premature Labour as a method of treatment in cases of contracted pelvis was in vogue to a much larger extent a couple of decades ago. In fact, the older text-books on midwifery described this method in detail and framed rules as to the period of gestation at which induction should be attempted when dealing with different degrees of contracted pelvis. A wider experience and a more correct appreciation of the limitations of this method of treatment, and of the possibilities of other methods of delivery in such cases, have greatly narrowed the indications for induction of premature labour.

If used at all induction should be performed at a stage when the child is not merely viable, but is capable of withstanding the pressure effect during its passage through the genital tract and being born alive, and of continuing to live after delivery. It has now been definitely admitted that induction is not justifiable before the 34th week of pregnancy, and, indeed, should be done preferably at the 36th week or even later. The advantages claimed are that at this period of pregnancy the head is relatively smaller and softer than at full term and can therefore mould to a greater degree and thus overcome the minor degree of disproportion in border-line cases of contracted pelvis. On the other hand, it must be admitted that there are difficulties associated with induction of labour. These are :—

(1) It is difficult to ascertain exactly the period of pregnancy, and in many cases it is the experience of most obstetricians that even with the data furnished by the patient, differences of a fortnight are not uncommon in calculating the exact date of the onset of labour. *A fortiori*, the same margin of error must be accepted in regard to the probable date of induction of labour.

(2) Induction of labour is a method of treatment in border-line cases, and it is just in these cases that it is difficult to ascertain before the patient is actually in labour the extent of disproportion present and the probability of the head coming through with moulding and strong uterine contractions.

(3) It must be accepted that at the 34th or 36th week compaction of the foetal ovoid is not perfect; particularly is flexion of the head incomplete, and under such circumstances, by whatever method one may try to elicit the amount of relative disproportion, the error resulting from the deflexed attitude of the foetal head will vitiate the judgment.

(4) Particularly in a tropical country where the average weight of the foetus is one pound less than the average weight of the European child, and where the chances of survival are less owing to various factors peculiar to a tropical climate causing an increased neonatal mortality, the necessity for optimum conditions at birth is so obvious that one should hesitate before inducing premature labour for the sake of the foetus.

For these reasons we have for some time discarded the practice of induction of premature labour in cases of cephalo-pelvic-disproportion. Our results have been more satisfactory since we have allowed these patients to go to term and then given them a trial labour, and employed such methods of artificial assistance as might be found necessary.

In cases, however, where induction of premature labour is decided upon as a method of treatment it should be attempted only after the 34th week. It is important to know exactly when such induction of labour should be attempted, and for this purpose the foetus should present by the cephalic pole; if it is not a cephalic presentation external version should be performed to convert it into one. After the 34th week periodic abdominal palpation should be done at short intervals, and with the second pelvic grip the extent of overriding of the head over the symphysis pubis should be estimated. An assistant keeps the fundus of the uterus firmly pressed down while the operator, by means of the second pelvic grip, grasps the head and tries to push it down into the brim, while at the same time with the thumb of the right hand he estimates the amount of overriding of the head over the symphysis pubis. The proper time for induction of labour is when the head just shows a slight degree of overriding, because at this stage if induction is performed the increased flexion of the head and the moulding that

occurs during labour will overcome this slight degree of overriding and allow the head to pass through the pelvic canal.

Munro-Kerr-Müller Method. Another method of estimating the probable date when induction should be attempted is by using



FIG. 152.—Munro-Kerr-Müller method of estimation of disproportion.

the Munro-Kerr-Müller method. Munro-Kerr describes his method as follows :—

“It is a bimanual method—the external hand pushes the head into the pelvis, while the internal fingers of the other hand estimate the relative size of the pelvis to the head. It may be employed with or without anæsthesia, but greater accuracy is obtained if the woman is anæsthetised. The patient is placed in the ordinary position for a gynecological examination and the accoucheur stands at her side facing her. The right hand seizes the head and presses it into the superior strait; two fingers of the left hand are passed into the vagina; these determine the consistency and manner of engagement of the head. Further information is obtained by utilising the thumb which is passed along the brim and estimates the degree of overlapping. By this method the relative size of the fetal head and maternal pelvis can be very exactly determined and a prediction made as to whether the head will pass spontaneously or will not pass through at all.”

Induction of labour at term is on quite a different footing from induction of premature labour, and we advocate this particularly in cases of contracted pelves for the following reasons:—

(1) A post-mature foetus causes a much greater degree of dystocia in cases of contracted pelvis owing to the greater amount of ossification and the consequent hardening of the head and the lesser degree of mouldability.

(2) The increase in the size of the head also is a factor to be taken into consideration, as with each week of post-maturity the foetus develops more rapidly.

For these two reasons we consider that *induction of labour at term* should be thought of in the treatment of contracted pelvis.

The methods of inducing labour are described in another chapter.

Induction of Abortion

Occasionally a woman who has had difficult labours may seek advice in the early weeks of pregnancy regarding its possible termination. Again, women with contracted pelves coming under observation in the early weeks of pregnancy may fight shy of a possible Cæsarean section at term, and demand termination of pregnancy. With the improved technique now available, and with the low mortality of elective Cæsarean section at term, where the patient has been under observation, there is no justification for induction of abortion in such cases. The risks of induction of abortion are no less than the risks of elective Cæsarean section at term. If abortion is to be performed by abdominal hysterotomy there is no reason why the woman should not submit herself to a Cæsarean section at term, and if considered necessary or desirable undergo sterilisation at the same time. For these reasons we do not consider induction of abortion as a method of treatment in cases of contracted pelves.

Forceps

The use of forceps in minor degrees of cephalo-pelvic-disproportion may be indicated in a variety of cases. It must, however, be understood that the obstetric forceps should never be used as a compressor. During the course of labour, however, conditions may arise which necessitate the application of forceps for the following reasons:—

(1) The uterine contractions which are responsible for the delivery of the foetus may not be sufficient to complete the labour.

or a degree of inertia may develop in such cases; a *vis a fronte* is needed to aid the *vis a tergo* of the uterine action.

(2) Occasionally, before spontaneous delivery can occur, the condition of the fœtus may give rise to anxiety. Signs of fœtal distress may manifest themselves either because of the prolonged labour or the greater degree of compression of the head in the pelvis, or in some cases due to the strong uterine contractions. In such cases where the greatest diameter of the head has passed through the brim, forceps is of considerable value in effecting delivery.

The terms "high forceps" and "floating forceps" are fortunately much less in use to-day, and it should be clearly realised that such methods of delivery, when the head is still above the brim, are absolutely contraindicated.

(3) Occasionally the forceps may be indicated in cases of occipito-posterior position complicating a border-line case of contracted pelvis; rotation and traction are required to supplement the efforts of the uterus.

(4) The forceps may be applied along with other methods of treatment of cases of contracted pelvis, described later, such as pubiotomy.

Version

The place of version in the treatment of contracted pelvis has been the subject of considerable discussion among obstetricians. Under certain circumstances it has a valuable place.

Version is sometimes indicated when a woman is in labour and the cervix well dilated but the head is still freely moveable above the brim of the pelvis. Occasionally, in border-line cases of flat pelvis, podalic version may be performed because of the fact that the wedge shape of the after-coming head may pass through more easily than a fore-coming head.

Version is particularly indicated in multiparæ where a slight degree of disproportion exists. This disproportion may not necessarily be due to a contraction of the pelvis, but may be brought about by deflexion attitudes of the cephalic pole, resulting in non-fixation of the head even when the woman has been in labour for some hours and the membranes have ruptured after full dilatation of the cervix. We have found in such cases that it is the safest method of delivery both in the interests of the mother and the fœtus. The alternative of a high forceps is not to be thought of in view of the risks already mentioned; and if, as occasionally happens, the strong uterine contractions bring about conditions

indicating foetal distress, there is no other method which affords a safer, readier and easier mode of delivery than internal podalic version and extraction. With experience the technique of the operation can be perfected, but certain essential conditions should be borne in mind in performing version and extraction, which are referred to in the chapter on version.

Postural Methods

Postural methods have a limited field in the management of labour in contracted pelvises. Two postures may be found useful: (1) Walcher's position, and (2) the exaggerated lithotomy position.

In **Walcher's position** the patient, lying on her back, is brought to the edge of the bed so that her pelvis rests upon it, but the buttocks project partially over the edge and both lower extremities hang freely down without being supported. If it is low, the foot of the bed may have to be raised to allow of this. When the patient is in this posture the conjugate vera is lengthened by the hyperextension of the thighs and the rotation of the innominate bones so that the symphysis pubis passes downwards. The inlet is thus enlarged and the true conjugate increased by about 6 to 12 millimetres ($\frac{1}{4}$ to $\frac{1}{2}$ in.). This position can be adopted in the first and second stages of labour. When it is adopted during labour the legs are supported on low stools between the pains, and allowed to hang freely down during pains. The chances for the head becoming fixed are increased, and it may go through the brim of the pelvis because of the increase in the anteroposterior diameter. More often Walcher's position is used at the time of delivery with forceps. If Walcher's position is adopted as an auxiliary to the application of forceps, it is necessary that the patient should be placed in the dorsal position first and the forceps applied and locked. After this has been done the patient is put in Walcher's position, the operator squats on the floor and pulls directly downwards till the head has passed through the brim of the pelvis. Once this has occurred traction must be stopped, the woman put back in the left lateral or dorsal posture, and delivery then completed. The reason for this is that while Walcher's position increases the conjugate vera, at the same time it decreases the anteroposterior diameter at the outlet; and consequently if the head is pulled through the outlet with the woman in Walcher's position, a greater amount of resistance will be encountered and occasionally the sacro-coccygeal joint may be dislocated.

Exaggerated Lithotomy Position. Here the woman is placed in the dorsal position and the thighs are acutely flexed towards the

abdomen, so that the symphysis pubis is carried forwards and upwards. In consequence thereof the anteroposterior diameter of the outlet is increased. This posture is therefore adopted in cases of funnel-shaped pelvis where the outlet is contracted in the anteroposterior diameter.

Enlargement of the Bony Pelvis

Enlargement of the pelvic cavity may be effected by cutting through the pelvic girdle. This may be done by one of two methods:—

- (a) By incising the symphyseal joint, or
- (b) By sawing through the body of the pubis to one side of the symphyseal joint.

Symphysiotomy, as the former operation is called, and *pubiotomy*, or *hebstectomy*, as the latter is named, have been performed for some time and have been both praised and condemned. It may be stated that at present few operators resort to symphysiotomy; but pubiotomy, as a method of treatment in some cases of contracted pelvis, still claims its adherents. The object of this operation is to increase the diameters of the pelvic cavity, so that in certain borderline cases of disproportion, the increased diameter will be sufficient for the safe passage of the head.

It has been claimed that prophylactic pubiotomy may be done with a view to secure a permanent increase in the capacity of the pelvis and thus allow labour to be completed uneventfully at term. If pubiotomy is to be performed in borderline cases of contracted pelvis, we fail to see how one can decide upon its necessity and perform a prophylactic pubiotomy some weeks before the onset of labour, unless it be in those exceptional cases where the woman has had one trial labour and the obstetrician is fully aware of the diameters of the pelvis with which he is dealing. Even in such cases, we believe, experience shows that in subsequent pregnancies it is not safe to prophesy the course of labour. We are therefore of opinion that prophylactic pubiotomy only exposes the woman to an unnecessary operation, and in doing so the obstetrician just misses the essential factor in pubiotomy, namely, the nicety of judgment which is required to decide about its necessity or otherwise at a particular stage of labour.

We deal with the details of these two operations, their indications, contraindications and scope, in a later chapter.

Abdominal Modes of Delivery

There are five methods of delivery through the abdominal route which may be adopted in cases of contracted pelvis :—

- (1) Classical or elective Cæsarean section.
- (2) Lower segment Cæsarean or laparo-trachelotomy.
- (3) Extraperitoneal Cæsarean or Latzko's operation.
- (4) Cæsarean hysterectomy (Porro's operation).
- (5) Porte's operation or exteriorisation of uterus.

Indications. The indications for abdominal methods of delivery in contracted pelvis are :—

- (1) When the pelvis is so contracted that there is no possibility of delivering even a dead foetus through the vaginal route.
- (2) When the contraction of the pelvis is such that a live foetus cannot be delivered through the vaginal route.

The particular mode of delivery will depend upon several factors.

The classical or elective Cæsarean section is generally performed in cases where the woman has been under observation during pregnancy, and a careful consideration of all factors has indicated the necessity for delivery by the abdominal route at term. It is performed at term or early in labour, when the patient has had no opportunity of becoming infected and her general condition is good.

The lower segment Cæsarean or laparo-trachelotomy has, in some cases, supplanted the classical operation. DeLee goes so far as to say that laparo-trachelotomy should replace the old classical Cæsarean in all but a few exceptional cases, such as inaccessibility to the parts from pendulous belly, kyphoscoliosis, etc., and where rapid delivery is required to save the child, and even here a very low classical section should be done.

Its main indication is in those cases of test labour where the woman has been some hours in labour, the membranes having ruptured, and it has been realised that the disproportion is such as to warrant delivery by the abdominal route. It may also be performed in "suspect" cases where the woman has been examined *per vaginam* and is possibly infected. It must, however, be realised that a lower segment Cæsarean section is not a method of delivery to be undertaken lightly when attempts at vaginal delivery have failed, or when the woman is seen late in labour after frequent vaginal examinations have been made, and in an exhausted condition following prolonged labour with probable intrapartum infection.

tion. The risks incidental to the operation, as far as the mother is concerned, are so great that one is not justified in undertaking a lower segment section in cases of delayed or neglected labour. Even the chances of survival of the fœtus after abdominal delivery are not very high, and under such circumstances, particularly if operative methods of delivery by the vaginal route have been previously attempted, it is not justifiable to submit the patient to a lower segment Cæsarean section.

Cæsarean Hysterectomy. It is in actually infected cases such as those mentioned above, that a Cæsarean hysterectomy may be the operation of choice. The infected uterus is a source of grave danger and should be removed if an abdominal mode of delivery is decided upon to save the child. Again, where the woman is seen at a late stage, with such an extreme degree of contracted pelvis that there is no possibility of delivering even a dead fœtus through the vaginal route, Cæsarean hysterectomy is the only possible method left.

We would, in this connection, state that the various crushing operations on a dead fœtus are attended with so much risk and danger of sepsis that we would prefer a Cæsarean hysterectomy to a series of mutilating operations that are sometimes adopted as a fitting finale for the delivery of a dead fœtus. In our opinion basilectomy and crushing of the head to such extreme degrees as to allow it to pass through a very narrow pelvis always mean so much bruising of the maternal soft parts, and a certainty of intrapartum infection, that it is safer to perform a Cæsarean hysterectomy.

Extraperitoneal Cæsarean Section. Here the uterus is opened extraperitoneally, and to that extent the risk of infection of the peritoneum is diminished. The operation may therefore be performed in those cases where sepsis is feared, but the technique is complicated and requires experience for its performance. Moreover, in some cases during the operation, the peritoneum may be accidentally opened into, when the chances of infection are necessarily great. Extraperitoneal Cæsarean has a very limited scope, and except in institutions staffed by experienced specialists it is not an operation that can be ordinarily undertaken.

Porte's Operation. This is a method of treatment that may occasionally be adopted in frankly septic cases, where a desire has been expressed to conserve the uterus. After making a large abdominal incision the uterus is brought out of the abdomen before it is opened. After delivery of the child it is allowed to involute outside the abdominal cavity and only returned to the abdomen later. Its use is limited.

Management of Labour in Different Degrees of Contracted Pelves

It is customary for most obstetricians to classify the different degrees of contracted pelves into four types, as a rough guide to decide as to the proper method of treatment to be adopted. It need hardly be emphasised that these are only aids in making decisions, and that treatment cannot be laid down on the principle of arithmetic proportions. Various factors have got to be taken into account, such as the relative disproportion of the head, the degree of moulding possible, the force of uterine contractions, the attitude of the fœtus especially in regard to flexion of the cephalic pole, the presentation and position and the presence or absence of other complications.

Bearing these general principles in mind, it is, however, useful to adopt the classification into four degrees and to discuss the principles of treatment suited for each one of them.

The classification is based upon the length of the true conjugate, and whether one is dealing with a generally contracted or a flat pelvis—these two being the most common forms met with.

Length of the True Conjugate in—		
Generally Contracted		
	Pelvis.	Flat Pelvis.
First Degree	4 to 3½ ins. (10 to 8.75 cm.)	4 to 3¼ ins. (10 to 8.1 cm.)
Second Degree	3½ to 3 ins. (8.75 to 7.5 cm.)	3¼ to 2¾ ins. (8.1 to 6.8 cm.)
Third Degree	3 to 2½ ins. (7.5 to 6.25 cm.)	2¾ to 2¼ ins. (6.8 to 5.6 cm.)
Fourth Degree	Less than 2½ ins. (Less than 6.25 cm.)	Less than 2¼ ins. (Less than 5.6 cm.)

Fourth Degree. Let us deal with the last type, the fourth degree of contracted pelvis, first. These are the extreme types, where the line of treatment can be definitely laid down. There is no possibility of a live child coming through the natural passages; nor is there any possibility of a dead child being delivered through the natural passages, even after mutilating operations. This fact must be clearly borne in mind, so that when a woman presents this type of contracted pelvis no difficulty arises in coming to a conclusion as to what mode of delivery is to be adopted. We have already stated that we do not advocate therapeutic abortion for such cases, and therefore do not consider it if the woman presents herself in the early months of pregnancy. Elective Casarean section at term is the only method of delivery to be thought of, and it ought to give exceedingly satisfactory results both for the mother and child.

It is perhaps not so clearly realised that the only mode of delivery is by the abdominal route, even if the woman is seen at a late stage of labour, no matter whether the child be dead or alive.

What the particular method of abdominal delivery should be is a matter for consideration. If the patient comes early in labour, and has not been subjected to internal examinations previously, either a classical or a lower segment Cæsarean section should be performed. The experienced obstetrician would prefer the lower segment section; but to the less experienced we would advise the classical method. Should, however, the patient seek assistance when she has been actually in labour for some hours, and has been examined vaginally, it is safer to perform a lower segment Cæsarean section (laparo-trachelotomy). It is just in these types of cases that lower segment section gives gratifying results; but at the same time it is well to realise the limitations of this operation. Sufficient emphasis cannot be laid on the fact that the lower segment section is not the last resort of a desperate obstetrician who has tried all other modes of delivery. Where a case has been subjected to frequent vaginal examinations, is obviously infected or where ineffective attempts at delivery have been made, the lower segment Cæsarean is not without serious risk to the mother. In such cases the only method of saving the foetus, and improving the prognosis for the mother, is the performance of a Cæsarean hysterectomy.

Another method of treatment through the abdominal route, which may occasionally be adopted, is the extraperitoneal (Latzko's) operation. This may be done in cases where the woman has been in labour for some time and it is feared that intra-uterine infection might have taken place. The great advantage of this operation is that the peritoneal cavity is saved from infection. But it ought to be realised that even here, uterine infection may persist. Hence hysterectomy in some cases may be desirable.

Having dealt with the extreme degree of contracted pelvis, we may now deal with the other three degrees *seriatim*.

First Degree (conjugate vera, 4 to 3½ ins. in generally contracted, and 4 to 3½ in flat pelvis). In a large number of these cases, provided sufficient time is given, the head will mould through and be delivered spontaneously without risk to the mother or child. Occasionally help with forceps may be necessary, particularly if the case is complicated with an occipito-posterior position or weak uterine contractions. Care must be taken to see that forceps is not applied till the greatest diameter of the head has passed through the brim of the pelvis.

An alternative method of treatment, particularly in flat pelvis, is podalic version. It is generally stated that this operation should not be done in a primipara; but our experience leads us to the conclusion that in suitable cases where the head is above the brim it is still a safe method to be employed.

Postural methods of treatment may occasionally be helpful in those border-line cases. Walcher's position increases the true conjugate, particularly in the flat type, and helps the descent of the head and can be utilised either in the first and second stages, or before actual delivery is effected with the aid of forceps.

Occasionally, often due to some miscalculation, the degree of obstruction may turn out to be greater than was anticipated. Taking due precautions, pubiotomy may be the wise choice and is an operation that will be found useful in selected cases.

Ordinarily a Cæsarean section is not indicated in this border-line type of contracted pelvis. Occasionally conditions may necessitate this operation, as where a trial labour has failed, or because of other complications during the course of labour. The choice between the classical and the lower segment Cæsarean, and the place of each in the treatment of contracted pelvis, has been referred to already and is considered at greater length later.

Second Degree (true conjugate, $3\frac{1}{2}$ to 3 ins. in generally contracted and $3\frac{1}{2}$ to $2\frac{3}{4}$ ins. in flat type). Here the pelvis is definitely contracted and will not allow of the safe passage of a full-term live foetus, and in such cases Cæsarean section at term is the operation of choice. The alternative method of delivery is induction of premature labour. This is a method attended with risks to the child and cannot therefore be considered as the best. In some cases a test labour may yet be allowed, because it is surprising how a head, which at the onset of labour appeared to be too big to pass through the pelvis, may sometimes mould through and be delivered easily. But if test labour is allowed, strict aseptic precautions should be taken, and when the test has not been found successful a lower segment Cæsarean section should be performed. Such cases require constant and careful watching during the course of labour.

Third Degree (true conjugate, 3 to $2\frac{1}{2}$ ins. in generally contracted and $2\frac{1}{2}$ to $2\frac{1}{4}$ ins. in flat type). It is impossible for a full-term child to pass through such a pelvis, and occasionally even a premature foetus cannot be delivered alive. Cæsarean section offers the only method of delivery of a live foetus; and even when the foetus is dead we consider it safer to do a Cæsarean section in the interests of the mother, than the mutilating operations necessary to extract a dead child. Wherever, therefore, the patient is seen sufficiently

early in labour Cæsarean section is the method of choice. If, however, the foetus is dead craniotomy may be done. Care must be taken before performing craniotomy to see that it is possible for the foetus to be extracted per vaginam with the diminished size of the head. It has been suggested that if the head does not descend other crushing operations may be adopted, such as cephalotripsy and basilectomy. We have referred to these operations elsewhere, and would state that, in our opinion, the prolonged manipulations necessary and the chances of injury to the maternal soft parts render these procedures more risky for the mother than the alternative of a Cæsarean section with, if required, hysterectomy.

Caldwell and Moloy's Classification

Caldwell and Moloy, from observations on the dry pelvis and roentgenologic examination of the living subject, have classified the variations in the female pelvis into five different groups :—

(1) The Gynæcoid Type. This is normal and possesses the characteristic features of the female pelvis. The group is subdivided, according to variations in the size of the subpubic angle, into pelves—

- (a) with a narrow outlet.
- (b) with a moderate outlet.
- (c) with a wide outlet.
- (d) large or small.

(2) The Android Type. This type approximates, to the male pelvis, particularly in the posterior segment of the inlet, and the extreme forms of this type of pelvis simulate the average male pelvis and may present the same four variations as in the gynæcoid type.

(3) The Anthropoid Type. This pelvis is said to resemble the pelvis of the anthropoid apes.

(4) The Platypelloid Type. Here the pelvis is broad and flat. This is a very rare type.

(5) Asymmetrical pelvis.

Caldwell and Moloy have discussed the obstetric significance of the different types of pelvis stated above.

The Gynæcoid Type. The small, generally contracted form of pelvis in this type is really of obstetric significance. Such a pelvis usually occurs in women of small stature, and as the foetus is also

relatively small, occasionally engagement of the head occurs and delivery is effected by the vaginal route. If the child fails to engage, the cephalopelvic disproportion is obvious and a Cæsarean section is the operation of choice.

The Android Type. This is the most dangerous type of pelvis from the obstetric point of view. If the head engages in the transverse diameter of the pelvic brim, the prominent sacrum and narrow posterior pelvis force it forward into the narrowed anterior portion. Here, the pelvis being more of the funnel-shaped variety, owing to the general convergence of the four walls of the pelvis towards the outlet, the head meets with increasing resistance as it descends. In the larger forms of this type mid-pelvic arrest occurs, where forceps is difficult to apply and version and breech extraction are equally dangerous. If the extreme types are identified before the onset of labour elective Cæsarean section is the safest procedure to adopt.

The Anthropoid Type. In this type, the anteroposterior diameter of the inlet is long and the transverse diameter relatively narrow. The promontory of the sacrum is high, the sacrosciatic notch is broad but shallow and the symphysis deep and wide. Depending upon the degree of contraction of the transverse diameter of the superior strait, the foetal head of average size may not engage in the transverse diameter and will be found floating above the brim at term. Engagement is possible only in the anteroposterior diameter, and if the child is small it may come through. The head tends to be arrested in the narrowed transverse diameter, especially if it has entered it. In the extreme forms, particularly when narrowing of the subpubic angle exists, the head fails to engage and a Cæsarean section becomes the only safe method of delivery.

Platypelloid Type. Here the foetal head must engage in the transverse diameter of the pelvic inlet. Unless the subpubic angle is narrow, the transverse diameter is the longest diameter throughout the pelvis. The head should be allowed to descend in this diameter to the pelvic floor. If assistance by forceps becomes necessary, rotation must not be attempted until the head has descended sufficiently and is low down near the outlet. Two possible injuries may result in the course of the delivery if the long diameter of the foetal head does not descend in the transverse diameter but is forced into the anteroposterior diameter, viz., serious intracranial injury to the child or separation of the symphysis.

CHAPTER XL

TYPES OF CONTRACTED PELVIS

Generally Contracted Pelvis

is "*pelvis æquabiliter justo minor*,"
(small round pelvis)

the diameters are proportionately reduced.
deformity of the pelvis.

definitely known. In some races, a greater
types may be met with. We have already
the pelvis in certain races and communities
and in others.

Contracted pelvis can be diagnosed by pelvimetry,

that all the external measurements are
uniformly shortened. On internal examination
diameters in all the planes of the pelvis will

four. In cases of vertex presentation in
the pelvis the mechanism does not differ materially
the pelvis. Two factors, however, have to be
the increased flexion of the head and the
moulding. The increased resistance offered to
flexion and the head invariably enters in
the pelvic diameters. Owing to increased flexion
the head can be reached with extreme ease on
if there is no cephalo-pelvic disproportion the
head enters uneventfully, internal anterior rotation
occurs in the pelvis; and with further descent the
head passes beneath the symphysis pubis, and the head
is delivered at the outlet of the pelvis by a movement
of the head; movement in the mechanism after restitu-
tion, and the rest of the delivery takes place in

of the head, with overlapping of the cranial
bones helps to decrease the size of the foetal head
of its passage through the contracted pelvis.
The labour may be considerably prolonged and
the contractions may be ineffective, necessitat-
ing the use of forceps to effect delivery. The prolonged pressure
increased moulding, may lead to intracranial
haemorrhages leading to deep asphyxia of the
foetus in the later stages of labour, and perhaps the
internal examinations entail increased risks of

sepsis which may sometimes lead to troublesome complications such as sloughing of the cervix or vaginal walls, with the formation of vesico vaginal fistula.

Treatment. The general principles of management of labour have already been referred to, and the treatment depends upon the degree of pelvic contraction.

Dwarf Pelvis

(Also known as "pelvis nana")

This type of pelvis is met with in one or other of the different types of dwarfs and is an extreme degree of the generally contracted variety.

The treatment is obvious. Pregnancy must be allowed to go on to term, and there can be only one method of delivery, namely, Caesarean section.

Generally Contracted Flat Pelvis

In this type of pelvis, not only are all the measurements diminished but there is a disproportionate amount of diminution in the anteroposterior diameter, so that the difference between the intercrural and the interspinous diameters is less than an inch. This type of pelvic contraction may occasionally be the result of rickets, so that we may have the rachitic and the non-rachitic forms of generally contracted flat pelvis.

The mechanism of labour is a combination of the mechanisms in a generally contracted and in a flat pelvis. The head enters the brim of the pelvis with marked flexion, with the suboccipito-bregmatic diameter in the transverse diameter of the pelvis. Asynclitism occurs usually, more often anterior asynclitism being present than posterior. Once the head passes through the brim of the pelvis the head may even become hyperflexed and the asynclitic deviation correct itself. With strong uterine contractions the head moulds, internal rotation occurs, and further delivery may take place in the usual manner.

Treatment. This type of pelvis, like the generally contracted, should be classified according to the degree of contraction and suitable treatment adopted in each case. Labour is usually more prolonged than in the normal or in either of the other varieties—generally contracted or flat pelvis. If test labour should fail a lower segment Caesarean section may be required. In many cases, provided sufficient time is given, the head will mould through, or only require assistance with forceps. Induction of labour before term is one of the methods advocated in such cases. Occasionally

and in very carefully selected cases, pubiotomy may yield good results. Cæsarean hysterectomy or craniotomy may be the other methods of delivery to be adopted, if the case is seen very late in labour.

Flat Pelvis

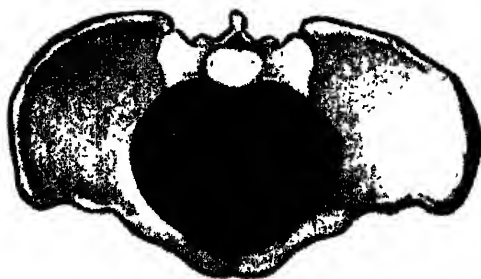
In this type of contraction, which is one of the rare varieties the anteroposterior diameter at the brim is shortened. It may be congenital in origin or, as in the large majority of cases, acquired as a result of rickets. The diagnosis of this type of pelvis is fairly simple; the external measurements show a difference of less than one inch between the interspinous and intercrystal diameters, while an internal examination reveals undue protrusion of the sacral promontory, with shortening of the diagonal conjugate.

Mechanism of Labour. In a flat pelvis abnormalities of position and presentation are common. Owing to the protrusion



FIG. 153.—Types of contracted pelvis.

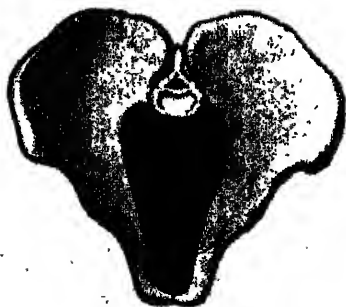
of the sacral promontory the head does not enter the pelvis early. Premature rupture of the membranes, prolapse of the cord, and imperfect dilatation of the cervical canal, are therefore not infrequent. Engagement of the head takes place, with the sagittal suture in the transverse diameter of the inlet; the head enters the pelvis in an attitude of slight deflexion, the bitemporal ($3\frac{1}{2}$ ins.) instead of the biparietal ($3\frac{3}{4}$ ins.) diameter engaging in the true conjugate of the inlet. As labour progresses the engagement of the head becomes *asynclitic*. By this is meant that the two parietal bones do not descend together simultaneously, but one or other of the parietal bones is found leading. If the anterior parietal bone is



A



B



C

FIG. 154.—Types of contracted pelvis.

leading, anterior asynclitism is said to occur; if the posterior parietal bone is lower, posterior asynclitism has resulted. Asynclitic engagement of the head is a feature of the mechanism of

labour in a flat pelvis and is generally noticed with any degree of flattening of the pelvis. On vaginal examination the sagittal suture may be noticed to be nearer the symphysis pubis or the sacral promontory, according as the asynclitism is posterior or anterior. Anterior asynclitism or Naegele's obliquity is more favourable for the termination of labour than posterior asynclitism, or Litzmann's obliquity. The reason for this is that when the anterior parietal bone is leading, the posterior parietal bone has got to encounter the resistance of the sacral promontory. With fairly strong uterine contractions, as the resistance is only at a point, the bone may slide past this point of obstruction. With posterior asynclitism, on the other hand, the anterior parietal bone is prevented from progressing downwards by the posterior surface of the symphysis pubis, which is a fairly extensive area, and as the bone has got to descend past the whole of the symphysis pubis the obstruction caused is much greater. With strong uterine contractions, however, the head may be driven into the cavity of the pelvis, and after the parietal bones have passed through the superior strait, synclitism results as the head has passed the seat of obstruction. The rest of the movement of increased flexion, with descent, internal rotation, extension, restitution and external rotation take their usual course.

In extreme degrees of flat pelvis the asynclitism may be so marked that the ear may be felt as the presenting part. In some cases, as the posterior parietal bone passes the obstruction of the sacral promontory it may be flattened out or a large spoon shaped or funnel-shaped depression may be formed. Occasionally even a fracture of the bone may result. In the lesser degrees of contraction a gutter-shaped groove may be formed running at right angles to the sagittal suture.

In the case of the after-coming head the mechanism is somewhat similar to that described above. A point of some importance to remember is that the after-coming head must pass the brim in the transverse diameter, and that to effect delivery the head must be in a slightly deflexed attitude.

Treatment. Treatment in this variety of contracted pelvis depends on the degree of contraction.

Prophylactic external podalic version may be attempted in cases with a minor degree of contraction of the flat variety.

In some cases of moderate degree of flat pelvis, where the head is still above the brim of the pelvis after labour has been in progress for some time, internal podalic version and extraction may be performed, with satisfactory results to mother and child.

In the extreme degree of contraction, Cæsarean section, and in neglected cases Cæsarean hysterectomy, may be necessary.

Walcher's position and pubiotomy are two of the methods adopted in cases of moderate degree to increase the size of the pelvis. Craniotomy may be performed if the child is dead, provided it can be delivered through the natural passages, with safety to the mother.

Rarer Forms of Contracted Pelvis

Many varieties of the rarer forms of contracted pelvis are described; but from the obstetric point of view it may be stated that they are so infrequently met with, that one may fail to come across many of them even in a large practice. Some of the rarer forms met with are described below.

OBLIQUELY DISTORTED PELVIS

In this type there is a deviation of part or whole of the pelvis to one or other side, so that there is a marked difference between the oblique diameters on the two sides.

This may be due to several factors, the chief of which are:

- (a) Congenital absence of one or other of the alæ of the sacrum. This is the typical Naegele's pelvis.

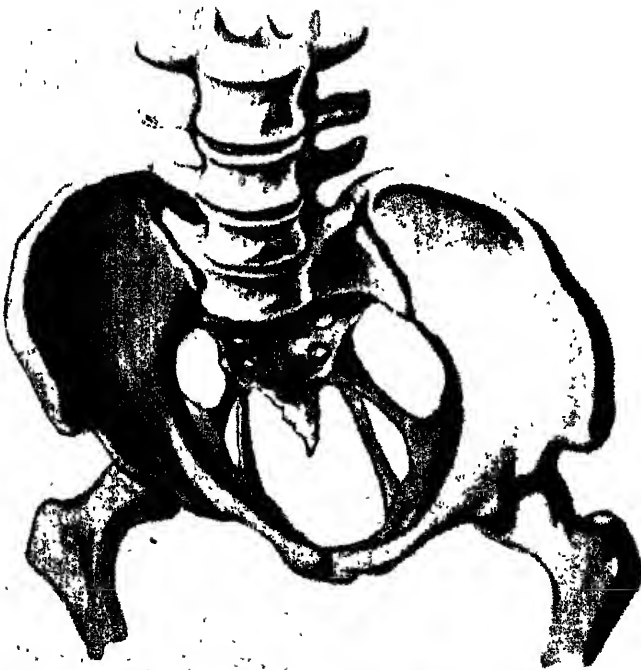


FIG. 155.—Obliquely contracted pelvis: Naegele's.

- (b) Due to spinal curvature (kyphoscoliosis) resulting in a lateral deviation and obliquity of the pelvic girdle (kyphoscoliotic pelvis).
- (c) Diseased conditions either of the sacro-iliac synchondrosis, or of the hip-joint, resulting in the tilting of the pelvis to one side (coxalgic pelvis).

(a) *Naegele's Pelvis*

This term is applied to those cases where the oblique distortion is due either to an absence or imperfect development of the sacral wing on one side. In the majority of cases this is a congenital defect. Occasionally the condition may be acquired as a result of diseases such as tuberculosis of the sacro-iliac joint, or paralysis of one lower extremity in infancy, resulting in the body weight being thrown on the sound leg.

Clinical Characteristics. The inlet is oval in shape; the crests of the pelvis are markedly asymmetrical and the symphysis pubis is deflected from the median line to the unaffected side, while the pubic arch is contracted. The outer surface of the symphysis pubis faces the diseased side instead of directly forward; the iliopectineal line of the affected side is almost a straight line, while the ilium on the sound side has got a greater curvature in its anterior part than normal. Further on the affected side the posterior superior spine of the ilium approaches the sacral spine, the sacro-sciatic notch is shallow and small and the ischial tuberosity is nearer to the coccyx. The pelvic cavity is divisible into a narrow part towards which the sacral promontory points and a wider part bounded in front by the symphysis pubis.

Diagnosis. When a routine pelvic examination is made the deformity is not likely to be overlooked. On internal examination the asymmetry will be easily recognised by the prominence of the ischial spines and the deflexion of the symphysis pubis. The existence of a scoliosis and the difference in the heights of the innominate bones, or a difference in the distance between the posterior spine on either side to the spine of the last lumbar vertebra, should suggest its presence. Naegele has suggested the following five measurements in such cases:—

- (1) The distance from the tuber-ischium of one side to the opposite posterior superior spine.
- (2) From the anterior superior spine of one side to the opposite posterior superior spine
- (3) From the spine of the last lumbar vertebra to the anterior superior spine on either side.

- (4) From the trochanter to the opposite posterior superior spine.
- (5) From the lower margin of the symphysis pubis to the posterior superior spines on either side.

Normally, there should be no difference in these measurements, when taken on either side, but in a case of Naegele's pelvis there is generally a difference of 1 to 1.5 centimeters.

(b) *Scoliotic Pelvis*

Scoliosis in the thoracic region produces a compensatory kyphosis in the lumbar region, so that the pelvis itself is not generally affected in such cases. Where, however, scoliosis affects the lumbar region the pelvis may be seriously involved.

Rickets is the commonest cause for this condition, and other signs of rickets may be present. Such a pelvis is readily recognised by the presence of the spinal deformities together with the signs of obliquity of the pelvis.

(c) *Coxalgic Pelvis*

This type of oblique deformity is due to unequal lateral pressure due to an imperfect or abolished use of one limb. It may be caused by:—

- (i) Tuberculous disease of the hip-joint resulting in some degree of shortening of the limb.
- (ii) Infantile paralysis (after acute anterior poliomyelitis).
- (iii) Dislocation of the hip-joint, congenital or acquired.
- (iv) Talipes of one side.
- (v) Amputation of one leg at an early age.

The earlier the age at which any of these troubles arise, the more pronounced is the deformity.

The condition may be readily diagnosed by the characteristic gait and by pelvimetry.

Prognosis and Treatment. The outlook is usually grave for both the mother and the foetus unless the condition is recognised early and suitable treatment adopted. The head of the foetus must pass through the oval of one side of the pelvis, namely, the healthy side of the pelvis, as the contracted side is not large enough to admit any part of the foetus. In effect, therefore, this reduces itself to a labour in a severe degree of generally contracted pelvis and the mechanism is similar to that in a generally contracted pelvis. Should the degree of obliquity be great the delivery of a live child is impossible. In the majority of cases Caesarean

section is therefore the only method of treatment if the child is alive and the mother is in good condition.

Transversely Contracted Pelvis (Robert's Pelvis)

This is the rarest form of contracted pelvis; it is due to a failure of development of the sacral alæ on both sides, resulting in synostosis on either side, the sacro-iliac synchondrosis being absent.

Characteristics. The sacral ala may either be absent or poorly developed. The sacrum is narrow, the promontory is very much elevated and on internal examination felt prominently. The spines and tuberosities of the ischia are closely approximated.

Diagnosis. A careful pelvimetric examination, with internal examination, if necessary, makes the diagnosis obvious.

Prognosis. Unless suitable treatment is adopted at an early stage in labour, the prognosis is always bad for the foetus and the maternal risks are also increased.

Treatment. Caesarean section offers the only satisfactory method of delivery in the interests of both mother and child. Within certain limits it may be possible to deliver a dead child after perforation and crushing. If, however, the contraction is pronounced the abdominal route should be adopted for the delivery, irrespective of the condition of the foetus.

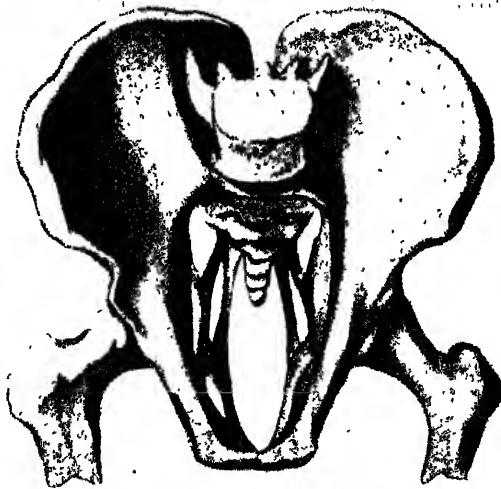


FIG. 156.—Robert's Pelvis.

Funnel-shaped Pelvis

In this variety the inlet may be slightly or not at all contracted, but the lateral walls of the pelvis slope towards the median line

and produce a progressively increasing contraction towards the outlet. The funnel-shaped pelvis is a little more frequent than the other rare forms of contracted pelvis. The outlet may be contracted in a number of other varieties of contracted pelves, such as the spondylolisthetic, osteomalacic and obliquely contracted pelves.

The typical funnel-shaped pelvis, however, is one where the pelvis appears more or less normal, if not actually bigger than normal at the inlet, but contraction is present at the outlet and may also be noted in the cavity.

Varieties. The contraction of the outlet may be in one of two directions—anteroposterior or transverse. In the anteroposterior type the diameter, which is relatively shortened, is the distance between the undersurface of the symphysis pubis and the tip of the sacrum. When the transverse diameter of the outlet is shortened a transversely contracted funnel-shaped pelvis is said to exist.

Diagnosis. The most certain method of spotting a funnel-shaped pelvis is to make a routine pelvimetric examination of the outlet. If this is not done, the obstetrician will meet with surprises late in labour, when the head becomes stuck at the pelvic outlet and cannot be easily delivered.

Prognosis. This depends upon the degree of contraction of the outlet, its early recognition, preferably antenatally, and the adoption of a suitable method of treatment.

Williams has clearly brought out the fact that when the transverse diameter is shortened in a funnel-shaped pelvis there is a progressive narrowing of the pubic arch, so that only a smaller segment of the head can possibly pass through it; and in the severer types that portion of the outlet posterior to a line joining the ischial tuberosities is the only portion available for its passage. Under such circumstances it is obvious that it is neither the transverse nor the anteroposterior diameters which can determine the possibility of the head passing through, but rather the space available between the transverse diameter and the tip of the sacrum. This diameter is called the posterior sagittal diameter. Its measurement added to the transverse diameter of the outlet should make 6 ins. before a normal full-time head can pass through the outlet.

Treatment. The appropriate treatment depends upon the degree of contraction of the outlet. In some cases where the pelvic contraction is not very great labour may end spontaneously. Occasionally help with forceps may be necessary. In minor degrees of contraction the exaggerated lithotomy position may be adopted to aid delivery of the head. This position, as has been noted

SPONDYLOLISTHETIC PELVIS

elsewhere, helps to increase the anteroposterior diameter of the outlet and so allow the head to pass through and is therefore more useful in its application to the anteroposteriorly contracted type of funnel-shaped pelvis than in the other variety.

Occasionally, pubiotomy offers a possible means of delivering a live foetus, provided the contraction is not extreme. If the contraction is ascertained early in labour the question of a Cæsar section should be considered, depending on the degree of contraction. Where the foetus is dead, craniotomy should be performed.

Spondylolisthetic Pelvis

In this deformity the last lumbar vertebra is displaced and lies in front of the base of the sacrum, so that the inferior surface comes in contact with and is united by bony union, with the anterior surface of the first piece of the sacrum. This produces a marked lordosis in the lumbar vertebræ; and the fourth, fifth and occasionally the second lumbar vertebræ may overhang the pelvic inlet, causing obstruction in the anteroposterior diameter. The amount of obstruction at the inlet depends on the extent of forward descent of the last lumbar vertebra and the degree of lordosis.



FIG. 157.—Sagittal section of a spondylolisthetic pelvis.

It is not clearly known what causes this condition. There may be two factors—a congenital factor and an acquired or traumatic factor.

The diagnosis is seldom difficult. There is marked lordosis in the lumbar region, the spine of the last lumbar vertebra is more easily felt than normally; the transverse diameter of the pelvis is increased owing to the flaring of the iliac bones, and there is a contraction of the pelvic outlet. The true conjugate is diminished, not on account of protrusion of the sacral promontory but owing to the last lumbar vertebra projecting forwards. The patient is generally short statured and the abdomen pendulous.

Prognosis. This depends upon the extent to which the pelvic cavity is encroached upon by the lumbar vertebra, so that the effect of this pelvis on labour is similar to that of the flat pelvis.

Treatment. It follows from what has been stated above that except in the very mild degrees, where the conjugate vera is only slightly shortened, the safest method of delivery is by the abdominal route. In the milder cases forceps may be applied, or occasionally version may be performed, or craniotomy if the child is dead.

Pelvis Obtecta

This is a condition where, owing to the presence of a marked lordosis in the lumbar region, the lumbar vertebræ overhang the pelvic inlet. The condition is also known as *spondylizema*. In this condition the forward curvature of the lumbar vertebræ overhanging the pelvic inlet virtually produces a false brim through which the foetal head has to pass. The conjugate diameter being seriously lessened there is little possibility of labour terminating *per vaginam*, and in most cases the safest method of delivery is by Cæsarean section.

Assimilation Pelvis

There may be three types of assimilation met with in the lumbo-sacro-coccygeal region of the spine:—

- (1) The last lumbar vertebra may be assimilated with the sacrum, in which case the sacrum will have six segments instead of five, and five foramina instead of four; while in the lumbar region there will be only four vertebræ.
- (2) The sacrum, instead of consisting of five pieces, which are in bony union with each other, may consist of only four pieces, the first taking the characteristics of one of the lumbar vertebræ, so that the lumbar portion of the spinal column will then consist of six bodies instead of five.

- (3) The coccyx may be assimilated with the last sacral vertebra.

The first type is known as the *high assimilation pelvis*, the second as the *low assimilation pelvis*, and the third as the *sacro-coccygeal assimilation*.

In the *high assimilation pelvis* there is a very high promontory, with a long sacrum, the concavity of which is markedly diminished, so that the pelvic canal is deep and the conjugate vera lengthened, while the transverse diameters are shortened. The outlet is contracted.

The other types of assimilation are very rare.

The management of labour in such cases will depend upon the extent to which the pelvic cavity is contracted in the antero-posterior and transverse diameters, and in the majority of them elective Cæsarean section offers the safest method of delivery.

Triradiate (or Crushed) Pelvis

This type of deformity may be caused by two factors: osteomalacia and rickets.

The *osteomalacic* is also spoken of as *malacosteon pelvis*. The *triradiate pelvis*, due to rickets, is occasionally called the *pseudo-osteomalacic pelvis*.

Osteomalacia is a disease that is more prevalent in certain parts of the world than in others. In India it is to be noted that while this disease is widely prevalent in Northern India it is



FIG. 158.—Triradiate pelvis.

practically non-existent in Southern India, and such cases as may occasionally be noticed there, are imported ones from Northern

India. Similarly, it is rare in America, but more frequently met with in Germany and particularly around the Rhine. The pelvic deformity is produced by a condition known as *mollities ossium* or *malacosteon* or *osteomalacia*, which usually occurs in women, and is characterised by decalcification and softening of the bones with resultant bending and fracture or deformity. The bones affected are soft and can often be bent or cut without difficulty. The bones most frequently affected are those of the pelvis, and next in order come the vertebrae, bones of the thorax, and those of the lower and upper extremities. The pelvis shows a marked deformity, the sacrum being displaced forwards and the acetabula pressed upwards and inwards. The onset of the disease is, as a rule, insidious.

During the course of pregnancy pain in the pelvic region, back, thorax and extremities may be complained of and tenderness on pressure over the affected bones may be present. The symptoms may disappear after labour and lactation, but with each pregnancy recur with increasing severity, till at last the patient is unable to move about freely; her stature becomes diminished and the labours tend to become more and more difficult. In no diseased condition may one meet with such extreme degrees of deformity of the pelvis as in *osteomalacia*. The promontory is pushed downwards and forwards; the pelvic walls on either side are pressed inwards, so that the anterior wall of the pelvis near the symphysis is pushed out in the form of a beak and the brim assumes the characteristic *triradiate* shape. The pubic arch is very much narrowed on account of the approximation of the ischial tuberosities. The acetabula look forward and the legs are brought closer together.

The diagnosis of the deformity is not difficult. The history of the disease and the characteristic nature of the deformity with the beak-shaped appearance of the anterior part of the pelvis cannot be mistaken.

Apart from the treatment of the disease, so far as labour is concerned, *Cæsarean* section offers the only possible way of delivering a live child. Occasionally it may be necessary to do a *Cæsarean hysterectomy* in infected cases.

Pseudo-Malacosteon or Rickety Triradiate Pelvis. The deformity here is due to the occurrence of a very severe type of rickets in early childhood. The innominate bones yield to the pressure exerted on them and are bent laterally, while the sacrum is pressed downward and bent in the same direction. The deformity is usually far advanced before the disease is controlled and the pelvis becomes fixed in its distorted form.

Diagnosis. The nature of the pelvis and signs of rickets in other parts of the body, with the history of infantile rickets, make the diagnosis clear.

Treatment is the same, so far as labour is concerned, as that adopted in the osteomalacic variety.

Split Pelvis

This is a very rare type of pelvis and is due to a congenital anomaly, namely, failure in the formation of the symphysis pubis, so that the pubic bones lie apart, the intervening area being filled by a fibrous band or by tissues. Almost invariably this condition is associated with *ectopia vesicæ*, and as imperfect development of the generative organs is not infrequent in such cases the condition is rarely met with in pregnant women.

In the cases which came under our observation delivery occurred at full term, without any difficulty. An occasional complication is due to the possibility of infection of the urinary tract owing to the exposed nature of the bladder and the ureters.

Pelvis Deformed by Tumours or Fractures

TUMOURS

The presence of exostosis or other kinds of tumours of the pelvic bones is very rare; but when such tumours do occur a high degree of dystocia may be caused. The exostosis may be found usually in otherwise deformed pelvis over one of the pelvic joints. Originally composed of cartilage they later become bony and may present a spiculed appearance at certain points, projecting into the pelvic cavity. They are very apt to injure the uterus or the descending head.

Cæsarean section is generally indicated in such cases, after which the growth may be dealt with if possible.

FRACTURES

Fractures of the pelvis may sometimes produce an extreme degree of contraction owing to the formation of callus and occasionally due to the projection of spicules of bone towards the pelvic cavity. The deformity resulting from fracture may vary greatly, depending upon the nature and seat of the fracture.

The extent to which labour may be obstructed depends upon the nature of the deformity and whether or not spicules of bone jut into the pelvic cavity, the result of malunion.

Treatment to be adopted depends upon the degree of contraction of the pelvis after union of the fracture, and if at all serious, Cæsarean section offers the best solution.

CHAPTER XLI

COMPLICATIONS OF THE THIRD STAGE OF LABOUR

Postpartum Hæmorrhage

HÆMORRHAGE that occurs after the delivery of the child is known as postpartum hæmorrhage. It may be of two varieties, primary and secondary.

Primary hæmorrhage is the term applied to hæmorrhage occurring immediately after the delivery of the child or within six hours thereafter.

Secondary hæmorrhage is hæmorrhage occurring any time from six hours after the completion of the third stage of labour until the period of involution is over, that is, six weeks.

Primary Postpartum Hæmorrhage

This is due to atonic or traumatic causes, that is, lack of tonicity of the uterus after the delivery of the child, or lacerations of some part of the birth canal. The normal mechanism by which hæmorrhage from the placental site is controlled after delivery is regulated by three factors: (1) contraction of the uterus, (2) retraction of the uterus, and (3) clotting of the blood. Additional factors of less importance are (4) apposition of the anterior and posterior uterine walls, (5) constriction of the walls of the vessels passing to the placental site. When any one of these factors is disturbed active postpartum hæmorrhage occurs.

Causes. Atonic postpartum hæmorrhage may be due to:—

- (1) Lack of muscular tone of the uterus;
- (2) Retention of portions of the after-birth within the uterus;
- (3) Improper stimulation of the uterine musculature.

Conditions which may produce lack of tone of the uterine musculature are overstretching of the uterus due to hydramnios; twin pregnancy; excessively large size of the fœtus; fetal monstrosities such as hydrocephalus, hydrothorax, ascites; concealed accidental hæmorrhage; tumours of the uterus, such as fibroids.

Loss of tone may also be due to weakness of the uterine musculature as a result of repeated child births, general malnutrition, or diseased conditions of the mother, such, as anæmia, toxæmia. It may also result from chloroform anæsthesia, especially after prolonged labour.

Mis-management of the third stage of labour is one of the chief factors responsible for the occurrence of postpartum hæmorrhage.

Premature stimulation of the uterus immediately after delivery causes a partial separation of the placenta, leading to a severe degree of postpartum hæmorrhage.

Occasionally hæmorrhage may be the result of diseased conditions or other abnormalities of the placenta resulting in partial separation.

A distended bladder or a loaded rectum by favouring inertia of the uterus may cause postpartum hæmorrhage.

Displacements of the puerperal uterus backwards sometimes give rise to a severe form of both primary and secondary postpartum hæmorrhage.

Atonic forms of hæmorrhage may occur in cases of placenta prævia and ablatio placentæ, and even though the bleeding may not be severe, in some cases it may be quite sufficient to adversely affect a patient who has already been exsanguinated by antepartum blood loss.

Traumatic postpartum hæmorrhage is due to injury to the birth canal. It may be the result of operative methods of delivery, such as the application of forceps, or rapid extraction of the child before the cervical canal is fully dilated and taken up. Occasionally the birth of a large child may cause some degree of trauma, and in some cases it may be due to impaction of the shoulders causing difficulty in their delivery with an excessive amount of stretching of the vaginal outlet.

The usual sites from which severe bleeding occurs in traumatic postpartum hæmorrhage are:—

- (a) Cervical canal—tears extending to the broad ligament and occasionally even involving the lower uterine segment.
- (b) Vagina—lacerations of the vagina particularly by the application of forceps in occipito-posterior positions.
- (c) Clitoris—lacerations due to large size of the head or attempts to save the perineum by unduly levering the head forwards.
- (d) Perineum—lacerations of the perineum as a result of hurried delivery, as in breech extraction or in cases where the head slips out suddenly as in occipito-posterior positions, in forceps delivery or when a large head or an impacted shoulder is being delivered.

The hæmorrhage in these cases is not severe, unless lacerations of the cervical canal involving the broad ligament or extending to the lower uterine segment are present. Occasionally the hæmorrhage from a torn clitoris may be fairly severe because of injury to the artery to the clitoris.

Signs and Symptoms. In the majority of cases the hæmorrhage is external; but occasionally the uterus may become distended with large blood-clots and rise to a considerable height above the umbilicus. The signs and symptoms are general and local: the general features being pallor, weakness, dimness of vision, small thready pulse, tendency to syncope, cold perspiration, restlessness and air hunger. The patient soon shows signs of anxiety, may develop nausea and vomiting, and constantly tosses about from side to side and complains of severe thirst. In extreme cases she quickly sinks into a condition of syncope with shallow respiration and death may supervene.

Side by side with these, it will be found on examination that the uterus is flabby, enlarged and full of blood-clots; or there may be a severe amount of external hæmorrhage. In some cases, although the uterus is contracted, external bleeding may still persist. In a few cases the uterus may not be easily palpable through the abdomen.

Sometime, backward displacement of the uterus occurs, the uterus lying posteriorly or occasionally partially in the pelvis and partially in the abdominal cavity. The kinking of the uterus in such a position leads to the retention of the blood-clots and favours atony.

Prognosis. The amount of hæmorrhage may vary within wide limits and the loss of blood may occur gradually or in a sudden gush. The prognosis depends upon the severity of the hæmorrhage and the underlying causative factors. Apart from the dangers of the hæmorrhage the prognosis is rendered serious on account of the possibilities of subsequent infection. If the case is treated promptly and adequately the prognosis is favourable.

Diagnosis. Diagnosis presents little or no difficulty in the large majority of cases. Occasionally the hæmorrhage may be concealed, or at least mostly concealed, in which case the condition of the patient, in association with the increased size of the uterus, will indicate the true state of affairs. It is necessary to differentiate between the atonic form of postpartum hæmorrhage and the traumatic form:—

Atonic Postpartum Hæmorrhage.

1. Generally occurs some little time after delivery.
2. May occur in gushes and clots may be expressed.
3. The uterus is flabby, lax and may be increased in size.

Traumatic Postpartum Hæmorrhage.

- Occurs immediately after delivery.
- Is continuous and is more bright red in colour.
- Uterus is generally firmly contracted and hard.

In traumatic hæmorrhage examination by a speculum will reveal the presence of lacerations at one or other of the different situations in the genital canal already mentioned.

We do not advocate the insertion of an intra-uterine tube or the giving of an intra-uterine douche for purposes of diagnosing whether the hæmorrhage is of the atonic or traumatic type, as we consider that this is attended with risks to the mother and is wholly unnecessary. Inspection of the after-birth may also reveal the probable cause, for if portions of the placenta or membranes or a succenturiate lobe be missing, the likelihood of atonic hæmorrhage occurring is greater.

It must also be mentioned that in the majority of cases the two forms of hæmorrhage are combined, as for instance after a forceps delivery it is common to have some degree of atonicity of the uterus in association with lacerations of some part of the birth canal.

Treatment. Postpartum hæmorrhage is one of the emergencies of obstetric practice, and an essential condition for success in its treatment is a definite plan which can be followed without hesitation in a systematic manner. Nothing is calculated to defeat the very purpose of the treatment more than the hesitating policy sometimes adopted and the varying methods tried without giving any single line of treatment a chance of success.

A general principle that may be laid down is, that as far as possible the less interference there is either with the vagina or with the uterus the better; and if it is inevitable vaginal interference is preferable to intra-uterine manipulations.

Prophylactic treatment should also be adopted in cases where there is the possibility of postpartum hæmorrhage occurring. Such types of cases are:—

Cases with previous history of postpartum hæmorrhage.

Multiparæ, particularly after the fourth confinement.

Hydramnios, twin pregnancy.

All forms of antepartum hæmorrhage.

Prolonged labour.

Instrumental deliveries under general anaesthesia.

In all patients suffering from anæmia and valvular disease of the heart.

General exhausting illnesses.

In such cases, delivery should never be hastened and artificial interference avoided as far as possible. The third stage should be conducted with extreme caution, and as a precaution the delivery room should be fully equipped with everything necessary for the immediate treatment of postpartum hæmorrhage, should it supervene. It may be desirable to increase the coagulability of blood

by the administration of calcium salts, and all measures taken to improve the general health of the patient will always be conducive to the prevention of postpartum hæmorrhage.

When postpartum hæmorrhage does occur, our aim is to promote firm contraction and retraction of the uterus, to control any bleeding from traumatic causes and to treat the patient for the accompanying hæmorrhagic collapse.

The condition of the uterus must be noted and also whether the placenta has already been expelled or not. If the placenta is *in utero* the uterus must be gently kneaded to provoke contractions, and if the placenta has separated it can be expelled by firmly compressing the fundal portion of the uterus and pushing it downwards and backwards in the axis of the brim of pelvis. After the expulsion of the placenta the patient should be given $\frac{1}{2}$ to 1 c.c. pituitary extract and 1 mgm of ergometrine by mouth or $\frac{1}{2}$ mgm intramuscularly. The uterus should be controlled abdominally by the palm of the hand being inserted behind the fundus and thus grasping the fundus. In a large majority of cases these simple measures are sufficient to arrest hæmorrhage.

Where traumatic hæmorrhage is also present it may be treated in one of the following ways:—

- (1) Suture of the lacerations.
- (2) Hot vaginal douches.
- (3) Plugging of the vagina.

The most desirable method of dealing with traumatic hæmorrhage is to suture the lacerations, thus arresting the hæmorrhage and at the same time repairing the damaged tissue.

When the lacerations are slight and particularly if they are in the vagina, the hæmorrhage is more from small vessels and can be controlled by means of a fairly hot vaginal douche—the temperature of the douche should be between 115 and 120° F.

Plugging the vagina affords a ready means of checking hæmorrhage from small irregular lacerations in the cervix or the vagina, and can be resorted to in an emergency when facilities for repair by suture are not available. Any lacerations of the perineum should be carefully sutured, not merely to prevent oozing of blood but also to ensure that the perineum is re-formed and chances of sepsis are obviated.

Once hæmorrhage is arrested, or simultaneously with the arrest of hæmorrhage, the patient should be treated for hæmorrhagic collapse. The foot of the bed is raised, the patient is covered with blankets; hot water bottles are applied. Blood or Plasma transfusion or gum saline intra-venously should be given in cases where there is marked collapse due to blood loss.

If the placenta is not separated and the patient is bleeding, placenta must be expressed by Credes' method after massaging the uterus and making it contracted and hard. If the placenta cannot be expressed and the bleeding still continues it is necessary to remove the placenta manually, taking all antiseptic precautions; and in such circumstances it is well to give the patient an anæsthetic to prevent the shock associated with intra-uterine manipulation. The placenta is gradually separated from edge to edge and removed by gripping hold of a thick portion of it. If the placenta is adherent, considerable difficulty may be experienced, and it may have to be removed piecemeal. A final exploration of the uterine cavity to make certain that no bits of placenta are left behind is necessary in such cases. After the removal of the placenta the same line of treatment as has been suggested above may be followed.

If these measures are not successful the bleeding may be controlled by grasping the fundus of the uterus with the left hand pulling it up, and with the thumb and the index and middle fingers of the right hand applied on either side just above the symphysis pubis, compressing the lower segment of the uterus along with the uterine arteries. By such compression it is possible effectively to control the uterine arteries on either side so as to diminish the quantity of blood that flows into the placental sinuses, while the uterus is kneaded and provoked to contraction by the injection of echolics.

In some cases the hæmorrhage is sometimes alarming and the uterus cannot be palpated through the abdominal wall due to its being retrodisplaced. We have, in these cases, introduced a few sterile artificial sponages into the posterior fornix of the vagina and thus lifted the uterus up into the abdominal cavity so that it can be massaged and provoked to contract. This has helped in a very large measure to control postpartum hæmorrhage resulting from retrodisplacements of the recently delivered uterus. We do not advocate hot intra-uterine douches, bimanual compression of the uterus, or intra-uterine plugging, as we consider that they produce an amount of shock apart from the added risks of sepsis and in our experience they are not essential for the arrest of postpartum hæmorrhage.

A method of treatment that has sometimes been advocated is compression of the abdominal aorta either by the fist applied to the abdominal wall pressing the abdominal aorta against the spinal column, or by means of a belt—Momburg's belt. Such methods of compression, particularly by any tight bandage round the abdomen of the patient or by means of a belt is, in our opinion,

contraindicated in the tropics where splenic enlargements due to various causes are not uncommon, and the chance of rupturing such spleens is by no means remote.

Operative treatments for postpartum hæmorrhage have been advocated, such as clamping the broad ligament, ligating the uterine arteries, or hysterectomy. As we have had no occasion to resort to any of these methods, we are not in a position to assess their true value. Such extraordinary measures must be rarely indicated, and if the methods advocated above are followed, they should never be needed.

We next deal with postpartum hæmorrhage, as it may sometimes present itself to the practitioner some hours after delivery. Occasionally patients are brought to an institution, after delivery in their own homes, in a condition of collapse due to hæmorrhage and with the placenta retained. The first point to be considered in such cases is whether hæmorrhage is still present or not. If it is not present and the condition of the patient is one of collapse, the first essential is to treat her for the collapse and not to interfere with the placenta. Any attempt at vigorous expression of the placenta or at manual removal will increase the shock and predispose to a recurrence of hæmorrhage and immediate collapse. In these cases the external genitalia should be cleansed, the cord cut as close to the vulval outlet as possible, an antiseptic pad applied, the foot of the bed raised, the patient treated for the collapse and watched carefully for signs of any further hæmorrhage. If there be no hæmorrhage the patient can be left alone for twelve to twenty-four hours till she rallies; and then the placenta may be expressed, or if it is partially adherent, be removed manually.

Secondary Postpartum Hæmorrhage

The *causes* of secondary postpartum hæmorrhage may be either general or local.

Among the general causes are certain affections of the heart, lungs or liver; acute infectious diseases; toxæmias and mental emotions.

The chief local causes are retained fragments of placenta or membranes; retained blood-clot; a secondary or succenturiate placenta; secondary hæmorrhage from lacerations of the cervix, vagina or vulva; displaced thrombi; tumours of the uterus such as fibromata, carcinomata and mucous polypi, or erosion of the cervix.

Symptoms. The hæmorrhage generally occurs some hours after delivery and gives rise to the same symptoms as occur in primary postpartum hæmorrhage, the severity depending upon the amount of blood loss.

Treatment. This must vary with the cause as in primary hæmorrhage. The best treatment is preventive. The third stage of labour as well of the first few days of the puerperium should be properly managed. Retention of placental tissues or membranes or of blood-clots must be avoided, as well as distension of the bladder or rectum. The patient should be kept quiet in bed till uterine involution is well advanced.

The curative treatment for this condition consists in ensuring that the uterus is completely emptied and that it properly contracts and retracts thereafter. A vaginal examination should be made; and if the cervical canal is patulous and allows a finger to be introduced, the uterine cavity may be explored and any retained material removed. If the cervix is not dilated and the hæmorrhage is profuse, the cervical canal should be dilated and the interior of the uterus explored and all retained fragments removed. In these cases, after evacuation of the uterus, if the bleeding does not stop a hot intra-uterine douche at a temperature of 115° F. may be given. The douche given at this stage will not cause the same degree of shock or tendency for separation of blood-clots as when it is given immediately after delivery, and so it is much less risky in secondary postpartum hæmorrhage than in cases of primary hæmorrhage. If the hæmorrhage is a result of old lacerations a hot douche followed by plugging of the vagina may be necessary.

General lines of recuperative treatment as for postpartum hæmorrhage should be adopted in such cases and the patient confined to bed for a fairly long time.

Retained and Adherent Placenta

Sometimes the placenta is retained or morbidly adherent, and may not be expelled within the normal period after the delivery of the child. This condition is more frequent in premature labours than in full time deliveries.

Retained Placenta. Normally the placenta is expelled within half to one hour after delivery in a primipara and in from fifteen to thirty minutes in a multipara. The placenta may, however, be retained for a longer period. Such retention may be due to:—

(1) Inefficient contractions of the uterus in the third stage of labour.

(2) Irregular uterine contractions generally caused by stimulating the uterus at too early a period after delivery or by the administration of ecbolics such as ergot.

(3) Hour-glass contraction of the uterus, which may result from such irregular contraction.

(4) Occasionally distension of the bladder or even a loaded return.

Adherent Placenta. Here the placenta is morbidly adherent, either in whole or in part, to the uterine wall. This may be caused by :—

- (1) Morbid adhesions as a result of decidual endometritis.
- (2) Inflammation of the placenta or infarcts of the placenta.
- (3) Anomalies of the placenta such as placenta succenturiata, placenta membranacea or placenta accreta.

Clinical Features. The chief symptom of retained placenta is postpartum hæmorrhage. The hæmorrhage may sometimes occur as a secondary hæmorrhage when a small portion of the placenta is retained, or an accessory lobe, as in a placenta succenturiata, is left behind. The hæmorrhage in such cases usually occurs within the first week of the puerperium and may be followed by repeated attacks of bleeding. It may occur when the patient first gets out of bed. Other complications may also ensue as a consequence thereof. When, however, the placenta is retained immediately after delivery the condition is obvious.

In cases of adherent placenta the hæmorrhage is insignificant when the whole of the placenta is adherent, as in the condition of placenta accreta, or a completely adherent placenta. Usually, however, portions of the placenta become separated, and from the exposed areas of the uterine wall a severe amount of postpartum hæmorrhage occurs.

Treatment—Retained Placenta. If the placenta is retained after delivery and is not expelled within the usual period of fifteen to sixty minutes, in the absence of any hæmorrhage, it may be left alone for a couple of hours.

The treatment depends upon the condition of the patient, the presence or absence of hæmorrhage, the extent of hæmorrhage, the presence of hour-glass contraction, and whether the placenta is morbidly adherent or not. We shall deal with each of the conditions in detail.

(1) *Retained Placenta without any Hæmorrhage occurring after Delivery.* In such cases, if the general condition of the patient is satisfactory, the placenta may be left alone for a couple of hours, after which it may be expressed by massaging the uterus, provoking it to contract and then compressing the uterine fundus and gently squeezing it in the direction of the axis of the brim of the pelvis. This method which is commonly associated with the name of Credé is spoken of as Credé's manœuvre.

(2) *If the placenta is retained and there is severe hæmorrhage,* the uterus must be massaged and compressed to expel all blood

clots, and occasionally the hæmorrhage may stop. In such cases time may be given for the placenta to separate and later, expulsion of the placenta facilitated by Credé's manœuvre. If, however, the hæmorrhage is persistent and the placenta cannot be expressed, it is not wise to allow the bleeding to continue as it will lead to collapse of the patient. Manual removal of the placenta is attended with risks, particularly the risk of sepsis; but if it is necessary it had much better be done before the patient has lost much blood, at a time when she can stand the intra-uterine manipulations better. We have often seen this operation postponed for fear of sepsis, with the result that when finally undertaken it has increased the shock and the collapse and has during the puerperium increased the risk of sepsis because of the anæmic condition of the patient. When, therefore, the placenta cannot be expressed and hæmorrhage is severe and cannot be controlled, with due antiseptic precautions and under anæsthesia, after cleaning the vulva and the vaginal outlet, the gloved hand is introduced into the uterine cavity and the placenta gently separated from one side to the other and removed. After removal of the placenta, the uterus must be massaged and kept contracted with injections of pituitary extract and ergot preparations, while other methods of treatment, outlined under post-partum hæmorrhage for collapse, should be instituted.

(3) *If the patient is seen for the first time with retained placenta and in a condition of collapse, but there is no hæmorrhage at the time, it is essential not to attempt to remove the placenta but to treat the condition of shock and collapse. If one gentle attempt to express the placenta by Credé's manœuvre fails, the uterus should be left alone till the patient has recovered from the condition of collapse. We would like to sound a note of warning against repeated attempts at expression of the placenta and the use of undue force in such attempts. The proper time to make an attempt at expression is when the signs indicative of separation of the placenta are present. Injudicious and forcible attempts at expression increase the shock and favour hæmorrhage and collapse. It is desirable to cut the cord as close as possible to the vaginal outlet, to clean the vagina and vulval outlet, apply an antiseptic pad, keep the patient at absolute rest and treat her for the collapse. Twelve to twenty-four hours later, the general condition will have sufficiently improved to permit of attempts at expression of the placenta being made again and these are now often successful; and if they fail, manual removal of the placenta with the usual precautions outlined already may be done.*

(4) *If, however, the placenta is retained and the patient is in a condition of collapse, and hæmorrhage is still present, or occurs at*

any later stage, attempts at expression of the placenta should first be made; but should they fail and the hæmorrhage persist, the placenta must be removed manually, in spite of the condition of the patient. Steps are taken simultaneously to deal with the shock and collapse.

(5) There is one method of treating a retained placenta to which we have not yet referred. It has been shown that about 300 to 400 c.c. of sterilised saline solution may be injected into the placental sinuses through the umbilical vein. The saline distends the placental sinuses and by increasing the placental bulk helps to separate the placenta from the uterine wall and favours its expulsion. This is useful and may be tried before resorting to manual removal. We would not, however, advise this method of treatment in the presence of severe postpartum hæmorrhage, as immediate manual removal is a more certain method of controlling the hæmorrhage.

(6) *Retained Placenta with Hour-Glass Contraction of the Uterus.* This is one of the troublesome complications of the third stage of labour and is usually due to mismanagement of that stage. Premature stimulation of the uterus to contract and expel the placenta is often the cause of this condition. It is due to a spasm somewhere in the lower uterine segment, the upper uterine segment being in a state of inertia, and frequently follows prolonged labour. It is possible that it may also result from injudicious intra-uterine manipulations or the administration of certain ecboles like ergot preparations before the placenta has been expelled.

The condition is usually discovered when the hand is passed into the uterus to remove the placenta because of severe hæmorrhage.

In the absence of bleeding, time may be given for the spasm to pass off, and an anæsthetic may be necessary to relieve it. If, however, hæmorrhage is present, the patient should be anæsthetised. The hand is introduced with care, the fingers are inserted into the constriction ring and gradually dilated while the other hand steadies the fundus of the uterus. Thereafter the placenta is removed. Some times it is necessary to give the patient an injection of morphia $\frac{1}{4}$ to $\frac{1}{2}$ grain—to allow relaxation of the constriction prior to the removal of the placenta.

In all cases where manual removal of the placenta is attempted, care should be taken to see that the entire placenta is removed; and, if necessary, the hand may have to be inserted again and the uterine cavity explored to prevent any fragments being left behind.

(7) Retained placenta with frank sepsis and no bleeding are best treated by leaving the placenta in utero and treating the case

as one of puerperal sepsis. The cord must be cut short, a diaper given and patient treated with chemotherapy. A low vaginal douche may be given if the discharge is profuse and foul. Usually by the 6th or 7th day when the sepsis is cleared, the placenta comes off by itself when the uterus is massaged. If at any time, the patient



FIG. 159.—Third stage of labour. Hour-glass contraction of the uterus with retained placenta. Method of manual removal of placenta.

begins to bleed profusely, it shows that the placenta is separated when it can be expelled easily by Credé's manoeuvre. In the absence of bleeding, there is no indication for interference till the sepsis is all got over and the placenta separates and comes away by itself. We have had opportunities of several cases being treated in this manner with highly gratifying results.

Adherent Placenta. In cases where the placenta is adherent, it cannot be expressed. The diagnosis is confirmed when the hand is passed into the uterus for the purpose of removing the placenta. An adherent placenta may, however, be suspected when the normal uterine contractions fail to expel it and hæmorrhage still persists. In some cases there is a previous warning history of morbid adhesions. Once the diagnosis is made it is advisable to remove the placenta unless the general condition of the patient contraindicates any intra-uterine manipulation. Even in these

circumstances, if the hæmorrhage is persistent, there is no alternative but to face the risk and remove the placenta. After removal of the placenta, firm contractions of the uterus must be promoted by injections of pituitary extract and ergot preparations.

The question whether an intra-uterine douche should be given in cases where manual removal of the placenta has been performed, either for adhesions or for simple retention, is a moot one. We are not in favour of an intra-uterine douche, but there are many obstetricians of experience who recommend this as an essential step in the treatment. If an intra-uterine douche is given care should be taken to see that the fluid is a non-irritating antiseptic at a temperature of 115 to 120° F., that it is given at a fairly low pressure, that the return flow is maintained and that the uterus does not become overdistended with the fluid.

Retained or Adherent Membranes

Not infrequently a portion of membranes is left in the uterus, and in some cases the whole chorion may be adherent. This may cause hæmorrhage and later lead to infection.

The **diagnosis** is usually made by a careful examination of the placenta and membranes after delivery.

Treatment. Small pieces of chorion retained do not require removal in the absence of any hæmorrhage and if the uterus is properly contracted. Injudicious attempts at removal by intra-uterine manipulation may only favour sepsis. The fragments of membrane are generally discharged in the lochia; and if the condition is recognised care should be taken in the puerperium to favour expulsion of the membranes by administering ecbolics, or occasionally by hot vaginal douches. We have sometimes seen fairly large pieces of chorion being expelled on the third or fourth day, with little or no complication of the puerperium.

Placenta Accreta or Increta

This is a very rare condition where the whole of the placenta is so morbidly adherent to the uterine wall because the villi have burrowed into the musculature. There is no decidua spongiosum. There is little postpartum hæmorrhage in such conditions, and it is recognised only when an attempt is made at manual removal. Care must be taken to see that the uterus is not punctured or torn through in the attempt at removal. If the placenta is completely accreta it is much more desirable to perform a hysterectomy than make ineffective attempts at manual removal.

Sequelæ of Adherent or Retained Placenta

The following sequelæ may occur in this condition :—

- (1) Puerperal infection.
- (2) Subinvolution of the uterus.
- (3) Secondary postpartum hæmorrhage.
- (4) The formation of a placental polypus.

Sepsis, the result of retained or adherent placenta, is usually due to infection from without, favoured by the lowered vitality of the patient resulting from hæmorrhage and the presence of the degenerating placental tissue. For these reasons strict aseptic and antiseptic care must be taken when removing the placenta manually.

Subinvolution of the uterus is not infrequent, partly on account of retention of some portion of the membranes or placenta, and partly due to the anæmic condition of the patient following postpartum hæmorrhage. In such cases involution is favoured by promoting free discharge of lochia by posture and ensuring uterine contraction. Hot vaginal douches, raising the head of the bed or adoption of the Fowler position, and the administration of ecbolics such as ergot and quinine, are indicated. For the secondary signs of anæmia the patient should be treated with hæmatinics.

Secondary Postpartum Hæmorrhage. This condition is dealt with in the chapter on postpartum hæmorrhage.

Placental Polypus. This is one of the rare sequelæ of retention of small portions of placenta and particularly of a succenturiate lobe. A piece of placenta remains adherent to the uterine wall, and by the gradual deposition of blood-clot over its surface it increase in size, and the uterus fails to involute completely. Contractions of the uterus gradually expel the placental polypus through the cervix which remains patent.

The chief symptom is hæmorrhage which occurs at a rather late period of the puerperium. There may be a slight rise of temperature; sometimes the placental polypus may be retained in the uterus for weeks or even months, and this is associated with persistent and intractable metrorrhagia and an offensive dirty vaginal discharge.

The **diagnosis** is made from the history, increased size of the uterus, and the nature of the vaginal hæmorrhage.

Treatment consists in dilating the cervical canal and removing the polypus either with the fingers or with a blunt curette. The uterine cavity is douched out and contractions of the uterus favoured by the administration of ecbolics orally or by injection.

Puerperal Inversion of the Uterus

Inversion of the uterus, by which is meant the uterus being turned inside out, may occur immediately after delivery :—

Ætiology. The factors that favour inversion are :—

- (1) Atony of the uterus.
- (2) Improperly applied pressure over the fundus.
- (3) Traction on the umbilical cord.
- (4) Fundal implantation of the placenta.



Fig. 160.—Complete inversion of uterus. The placenta is still adherent to the uterus.

Inversion is brought about either by pressure from above or by traction from below, in the presence of an atonic uterus and a soft dilated os. The condition that may favour pressure from above is excessive force used in the expression of the placenta, particularly during the period of relaxation of the uterus. Occasionally, at the end of the second stage, forcible attempts to express the fœtus may cause a slight dimpling of the fundus, which, together with the straining and subsequent uterine contractions, may increase this dimpling and lead to inversion. In some cases faulty compression of the uterus, after expulsion of the placenta to arrest hæmorrhage or to express blood-clots, may similarly favour inversion. Traction on the cord and so pulling on the placenta before complete separation and unskilful attempts at manual removal of the placenta may also cause inversion.

Varieties. Inversion of uterus may be of three degrees:—

First Degree—There is a dimpling of the fundus, which, however, still remains above the internal os.

Second Degree—The fundus passes through the internal os.

Third Degree—The uterus is completely turned inside out and lies partly outside the vulva.

Symptoms. Acute puerperal inversion of the uterus is one of the most serious of obstetric complications. Two symptoms dominate the clinical picture—shock and hæmorrhage. The hæmorrhage is sometimes of an intractable nature and not till the inversion is reduced can it be controlled. Where the inversion is complete the congested endometrium of the uterus, with or without the placenta attached, can be seen lying outside the vulva and is easily recognised.

Diagnosis. The incomplete forms of inversion present more difficulties in diagnosis. In addition to the hæmorrhage and shock, abdominal palpation shows the fundus to be absent or deficient, with occasionally the presence of an actual dimple. Vaginal examination will reveal a soft, globular swelling in the vagina or cervical canal, which, together with the fact that the fundus cannot be felt by abdominal palpation, at once suggests the diagnosis. In the differential diagnosis of this condition, fibroid polypi, adherent placenta and total atony of the uterus should be considered, but a careful bimanual examination will easily help to differentiate these conditions.

Prognosis. The prognosis of this condition is grave, although with efficient help at hand to apply energetic treatment the mortality may be considerably reduced. The shock and collapse associated with inversion are out of all proportion to the hæmorrhagic loss. Death is due to shock, hæmorrhage or sepsis.

Prophylaxis. In a serious condition such as this, associated with a high mortality, every effort should be made to prevent its occurrence by care in the conduct of the third stage of labour. This consists in strictly avoiding any traction on the cord or applying unskilful pressure to the funds of the uterus and by ensuring proper rest to the patient.

Treatment. An inverted uterus must immediately be replaced. This should be done preferably under anæsthesia; but even if an anæsthetic is not available there should be no delay in attempting to replace the uterus. The principle to be borne in mind in replacing an inverted uterus is that the portion that came down last should be replaced first; and as generally a portion of the cervical canal is the last to come down it should be replaced first, and the fundal

portion should be the last. As a matter of fact, in the majority of cases during the replacement of an inverted uterus, the fundal portion flops back into position once the greater part of the inverted uterus has been replaced. Due antiseptic precaution should be taken and the inverted exposed portion of the uterus thoroughly cleaned and washed with a mild antiseptic, and then steady, firm pressure applied with the fingers. The other hand should be on the abdomen to support the uterus as it is being replaced. After reposition, the fundus should be massaged carefully, uterine contractions promoted, and the patient treated for shock and collapse.

In case the woman is in deep shock, immediate attempt to replace the uterus may turn the tide against her. In such cases it is better to replace the fundus in the vagina, pack the vagina with anti-septic gauze and treat the patient for shock and collapse with blood transfusion and morphia. If bleeding however is free, it is necessary to take immediate steps to replace the uterus risking the added shock that may supervene.

Should the placenta, if attached to an inverted uterus be removed before reposition? This is a point on which opinions differ. The advantage of removing the placenta before reposition is that it is easily and thoroughly done under direct vision and the mass to be replaced is thereby reduced in size, but the disadvantage is that a severe postpartum hæmorrhage may occur which cannot be controlled till the uterus has been reposed. If there is difficulty in reducing the inversion, under such circumstances, it necessarily follows that the patient runs a serious risk of collapse. *Per contra*, while there may be some difficulty in removing the placenta after reposition, the advantage claimed is that the uterus is much more under control if postpartum hæmorrhage should supervene. We are inclined to favour the view that it is preferable to remove the placenta after reposition of the inverted uterus in favourable cases. Should there be any likelihood of difficulty, it is best to remove the placenta before reposition.

Chronic Puerperal Inversion

In some cases inversion may not be recognised at the time of its occurrence, or the patient may only be seen for the first time some days later. In such cases the patient suffers from repeated hæmorrhages and a slight rise of temperature. The endometrium being exposed presents a granular, shaggy appearance due to chronic congestion and infection particularly over the placental site. The condition is recognised on a vaginal examination.

reveals the presence of a globular swelling, with the soft thickened endometrium presenting a hyperæmic appearance when seen with a speculum.

Diagnosis. The condition is very often confused with *prolapse of the uterus* or a *fibroid polypus*.

The globular nature of the mass, with its velvety surface, the absence of the external os at its lower end, and the presence of the ring of the dilated cervical canal above the mass, will help to differentiate the condition from prolapse of the uterus.

A fibroid polypus may easily be mistaken for inversion of the uterus; but on bimanual examination the fundus of the uterus is palpable in its normal position. A careful vaginal examination with the finger introduced into the cervical canal, if possible, will help to differentiate the condition. A fibroid polypus is harder and does not present the same soft, velvety feel of an inverted uterus. If a uterine sound is passed, the normal or increased length of the uterine cavity can be demonstrated together with the pedicle of the fibroid polypus, whereas in the case of an inverted uterus the sound passes less than the normal distance.

Treatment. The immediate treatment is to attend to any sepsis present. The congestion of the endometrium may be relieved by hot vaginal douches and the application of mild antiseptics. When the endometrium has been cleaned an attempt may be made under an anæsthetic to replace the inverted uterus. If this proves unsuccessful it is much better to improve the general condition of the patient and to treat her for the hæmorrhage and chronic endometritis, and only at the second or third month after delivery undertake an operation for the replacement of the inverted uterus.

The operation may either be by the vaginal route or the abdominal route. The classical operation described by Spinelli is done by the vaginal route. The technique of the operation is as follows: The vagina and the inverted uterus are carefully cleaned; the anterior fornix is incised and the bladder is separated from the uterus. The utero-vesical peritoneal pouch is opened into and the inverted uterus exposed. The cervix is caught on either side of the median line by two volsella and is incised in the midline, the incision being continued down the anterior wall of the inverted corpus uteri sufficiently low to allow the inversion of the uterus to be reduced. The uterus is then replaced by grasping the sides of the incision with the fingers of both hands and making pressure against the fundus with the thumbs. The incision in the uterus is closed by a layer of sutures, a drainage tube is inserted, and



FIG. 161.—Inversion of the uterus, showing the steps of the operation in reduction of the inversion through the abdominal route.

the vaginal mucous membranes sutured with the drainage tube in position.

An operation through the abdominal route is sometimes of great advantage, especially in those cases where the cervix is not within easy reach of the finger, and considerable difficulty is experienced in reaching the anterior fornix and separating the bladder. We have performed this operation on two occasions and on p. 616 are given the diagrams which give the detailed technique of the operation.

CHAPTER XLII

INJURIES TO THE PARTURIENT CANAL

DURING the process of delivery the genital passages are stretched, and in the majority of cases of normal labour such stretching should not lead to any injury. But on account of various factors associated with the phenomena of labour such as anomalies of the passages, the forces of labour and the passenger, injuries are not uncommon, both in spontaneous as well as in assisted deliveries. The extent of such injuries depends upon the care exercised by the obstetrician and the skill with which the delivery is conducted. Where a proper consideration has been given to all the factors concerned in any particular case, it ought to be possible to avoid or at least minimise such injuries. In some cases of assisted labour it may be impossible to avoid them; but they are usually of a minor nature if the operation has been performed skilfully and the conditions necessary for its safe performance have been observed.

Injuries to the parturient canal may broadly be classified under two heads :—

- (1) Injuries to the bony parts.
- (2) Injuries to the soft parts.

Injuries to the Bony Parts

Injury to the bony parts is extremely rare, but the following may be damaged :—

- (a) The symphysis pubis.
- (b) The sacro-coccygeal joint.
- (c) Occasionally the sacro-iliac synchondroses.

Injury to the Symphysis Pubis. This sometimes occurs spontaneously, but is more often produced during the forcible extraction of the head through the pelvic brim, either by forceps

or in a breech delivery. When it occurs spontaneously, it is generally the result of strong uterine contractions driving the head suddenly throughly the pelvis. This accident is not generally serious, as it does not lead to wide separation of the pubic bones. The patient may complain of pain and tenderness over the symphysis pubis and there is a distinct gap to be felt between the pubic bones.

In cases of artificial delivery, on the other hand, the damage is greater, as a wide separation of the symphysis pubis usually results, and is associated with serious injury to the soft parts. In some cases the urethra and the bladder may be involved; the subjacent vessels may be injured and severe hæmorrhage result. If there is a very wide separation of the bones, the sacro-iliac joints themselves may be affected. In the majority of cases, however, such serious damage does not occur.

Diagnosis. The condition is suspected if the patient gives a history of something having given way if the delivery has been spontaneous, or during an assisted labour if the operator can feel and sometimes hear the grating sound produced by the snapping of the cartilage. The gap between the pubic bones, the tenderness on pressure, and the pain felt more particularly on movement of the limbs, confirm the diagnosis.

Treatment consists in keeping the patient at rest on a firm bed with strips of adhesive plaster applied tightly round the whole pelvis so as to immobilise the joint. A firm binder around the pelvis may also be applied and this gives a feeling of security and comfort to the patient. In those cases where difficulty in micturition is experienced, care must be taken to see that the bladder is emptied with strict aseptic precautions. A self retaining catheter may, with advantage be left in for a few days. The patient may be allowed to move about after two to three weeks, and usually little discomfort is felt if treatment has been undertaken sufficiently early.

Fracture and Dislocation of the Coccyx. This injury generally occurs during extraction of the fœtus. It is more likely to occur in those cases where there is limited mobility at the sacro-coccygeal joint and where the subpubic angle is narrow, so that the head has to emerge more posteriorly at the outlet.

The condition may not be recognised till some months after delivery, when the patient will probably complain of pain in the lower part of the sacrum, particularly in the sitting posture. Palpation of the now rigidly mobile or displaced coccyx will enable one to diagnose the condition. Occasionally, a persistent neuralgia is present and is known as coccydynia. If the pain is severe it may be necessary to remove the coccyx.

Injuries to the Sacro-iliac Synchrondroses. These may result after pubiotomy or when the symphysis gives way spontaneously during the process of delivery. There is flaring out of the iliac bones and the ligaments of the joints are torn and so do not support the pelvic girdle. The patient is unable to use the limbs freely and complains of pain in the region of the sacrum.

Rest in bed with proper support to the pelvis by strapping for two to three weeks may be necessary, after which the patient may gradually be allowed to move about.

Injuries to the Soft Parts

Injuries to the soft parts may be :—

- (1) Injuries to the vulva.
- (2) Injuries to the vagina.
- (3) Lacerations of the cervix.
- (4) Rupture of the uterus.

Injuries to the Vulva. These are very common, and if a careful examination be made, slight tears of the labia minora, the fourchette, and sometimes the vestibule may be detected. The lacerations are generally slight and may not require any treatment. Sometimes, however, it is desirable to suture the tears with catgut.

Lacerations of the vestibule may, in some cases, give rise to severe hæmorrhage, from injury to the vessels of the clitoris. The most efficient method of controlling such hæmorrhage is by a suture.

The perineum is the most common seat of a tear. The extent of the tear often depends upon the care taken and skill displayed during delivery of the head. The precautions to be taken to avoid such a tear have already been mentioned in dealing with the conduct of normal labour and the care of the perineum. It is important to recognise that every effort should be made to prevent a tear, in view both of the immediate and remote effects. A tear of the perineum, especially if it is fairly extensive, may result in infection of the genital tract owing to the proximity of the anus; and if such a tear be neglected, the weakness of the pelvic floor will gradually lead to a series of changes resulting eventually in various degrees of prolapse of the uterus and vaginal walls. In some cases, although superficial skin may be intact, the deeper structures forming the pelvic floor are lacerated, giving rise to weakness of the pelvic floor in the same manner as if a tear of the perineum, involving skin, had occurred. In view of these facts it should be a general rule to examine the perineum carefully in every case of labour to see if there are any lacerations, and, if present, carefully to suture the parts so as to re-form the perineal body as efficiently as possible.

Four degrees of perineal laceration are described:—

- (1) A slight tear of the perineum, the tear involving only the fourchette and anterior margin of the perineum.
- (2) Lacerations reaching up to the margin of the anus but not involving the sphincter.
- (3) Complete laceration of the perineum, the tear extending into the rectum.
- (4) A central perineal tear which leaves the posterior commissure and the anterior margin of the perineum intact, but may involve the central portion of the perineum even up to or including the rectum.

Ætiology. The most common causes of perineal lacerations are:—

(1) Disproportion between the foetus and the soft parts. Generally it is due to a large head or an imperfectly flexed head, but in some cases, particularly with anencephalic monsters and unduly large children, the head may not give the same amount of trouble as the shoulders, in the extraction of which the perineum may be badly lacerated.

(2) In some cases the vulvar outlet itself may be very small, or the parts may be extremely rigid, as in elderly primæe.

(3) Too rapid a delivery, either spontaneous or assisted, may tear the perineum, by not allowing the vulva to stretch sufficiently before the head emerges. This is likely to occur in cases of rapid extraction of the after-coming head, and in forceps application where the head slips out suddenly, particularly in occipito-posterior positions.

(4) Diseases of the soft parts. Old perineal cicatrices, cedema of the soft parts generally as a result of prolonged labour, or diseases such as infective granulomata and elephantoid conditions of the perineum predispose to lacerations.

(5) Narrow subpubic angle, by causing the head to emerge out more posteriorly, may cause undue stretching of the perineum and thus favour lacerations. In a contraction of the bony pelvic outlet the perineal lacerations tend to be of the third degree.

Diagnosis. Perineal lacerations can easily be diagnosed by a careful local examination after delivery. It is necessary to examine the vulva in a good light, and to separate the labia to see to what extent the pelvic floor has been damaged, with or without involvement of the skin.

Treatment—Prophylactic. If proper care is taken in the protection of the perineum, as already outlined in the chapter on the

conduct of normal labour, a large number of perineal lacerations can be avoided. Even when they seem inevitable, the lacerations may be limited to the first degree or, occasionally, the second degree, but should never involve the rectum. When operative delivery is undertaken, it is exceedingly important to realise that sudden extraction will lead to serious perineal lacerations. It has been our practice not to complete the delivery of the head with the forceps, but to allow it to stretch the perineum so that the woman with each breath, as it were, breathes out the head. This allows sufficient time for the perineum to stretch, so that when the head is almost crowned, the forceps is removed and the delivery completed in the manner already described under normal labour. When the after-coming head is to be delivered, once it has passed through the brim of the pelvis, there is no necessity for undue haste, and the head should be delivered gradually allowing the perineum to stretch.

Another precaution that ought to be taken in breech cases is to iron out the vagina and so stretch the perineum sufficiently before the breech is delivered. Much of this ironing out is done if the breech is allowed gradually to distend the perineum before it is extracted.

In cases, however, where a tear of the perineum is inevitable, an incision may be made with a view to ensure a clean cut, and by diverting it away from the anus, prevent extension of the tear to the rectum. Such an operation is known as "episiotomy." Episiotomy may be either medial, lateral or mediolateral. Before such an operation is undertaken, care must be taken to see that the head has stretched the perineum to its maximum extent.

Episiotomy is generally done by a mediolateral incision with a pair of scissors. The perineum is cut through to one or other side of the median line, and generally at an angle of 30° from it. The advantage in performing the mediolateral episiotomy is that, if the incision should unfortunately extend, it will lead farther away from the anus, so that the sphincter is never involved. Perineal tears and episiotomy wounds seldom bleed profusely. After delivery of the foetus the episiotomy incision is carefully sutured up. In cases where the outlet is very narrow and the perineum likely to tear extensively, a double episiotomy may sometimes be done. This is not, however, desirable, as weakening of the pelvic floor is likely to result. In a few cases, where the extent of the tear can be easily gauged, a central incision in the median raphæ is sometimes done, and so the levator ani fibres are not damaged. Care must be taken, however, to see that there is no possibility of its extending towards the rectum during the further course of delivery.

Curative. All tears of the perineum must be carefully sutured. In lacerations of the first degree a couple of catgut sutures to the vaginal mucous membranes may first be applied, so as to bring the edges into apposition, and then the skin with the whole thickness of the perineal body may be sutured up with silk or linen thread. If there is a clean tear of a minor degree it is unnecessary to put in the vaginal catgut sutures. The whole thickness of the perineal body can be closely approximated by through-and-through perineal sutures.

Lacerations of the second and third degree require much more thorough repair. The perineal repair may be done before expulsion of the placenta; but it is not advisable to do this where there are extensive tears of the perineum, as in the subsequent delivery of the placenta, should difficulty arise, and manual removal of the placenta be necessitated, the perineal stitches will have to be removed. It is better, therefore, to wait till the end of the third stage of labour before repair is undertaken. In the alternative, sutures may be put in but tied only after the expulsion of the placenta.

In all cases the patient should be anaesthetised with general or local anaesthesia before repair of the perineum. She is brought to the edge of the bed and placed in the lithotomy position. The area is cleaned and exposed to a good light. In complete lacerations, involving the rectum, the repair should be done with proper assistance and with all aseptic precautions. After thoroughly cleansing the wound and the adjoining surfaces, the area may be kept fairly dry by inserting a large sterile sponge into the vagina to prevent the flow of blood.

During the operation the following steps have to be noted. The levators ani should be closely approximated; the vaginal tears should be sutured; if the rectum is involved, it should be reformed carefully by suturing the anterior rectal wall; and lastly, the skin edges should be brought into apposition. Catgut sutures are generally used for the deeper structures and silk or linen thread for the skin.

For proper union, the after-care of the case is all-important. The legs should be kept in close apposition and the parts kept clean and dry. It is better in these cases not to allow the bowels to move for the first few days. Later, when the bowels are allowed to move, particular care should be taken to see that after each evacuation the perineum is thoroughly cleaned, dried, and a mild antiseptic applied. The patient is given light diet. On the fifth or sixth day, in cases of complete tear, the patient may be given a mild laxative.

In some cases, where hard, scybalous masses are formed, it is desirable to inject an ounce or two of olive oil into the rectum, so as to soften the fæces, and follow this, if necessary, by a glycerine enema. Usually, the perineal sutures are removed by the eighth day. If these sutures are cutting through it is better to remove

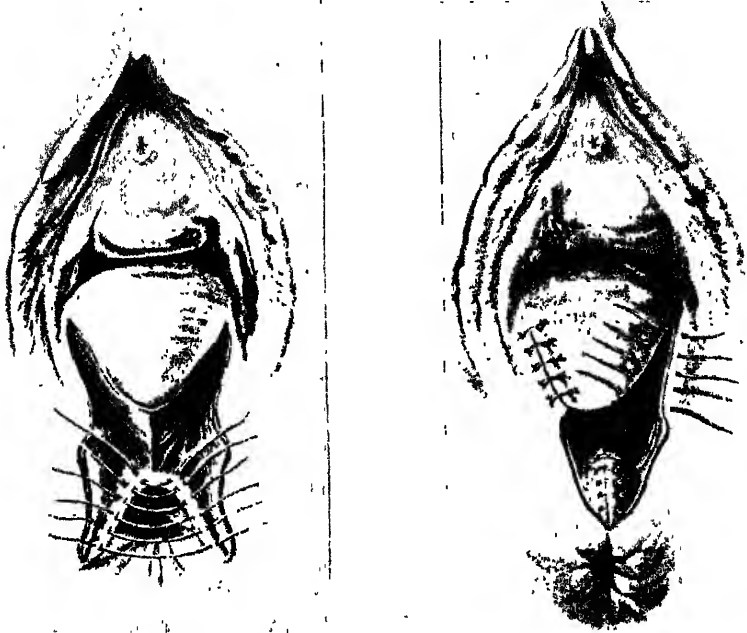


FIG. 162.—Repair of a complete laceration of the perineum.

them even earlier. Occasionally, a certain amount of œdema of the perineum develops, when it may be desirable to apply hot boric fomentations. If, however, the perineum has not united, and there is evidence of infection, one must face the inevitable necessity of removing the sutures so as to permit of proper drainage. Healing occurs later by granulation.

Secondary Repair of the Perineum. This question sometimes arises in cases where the primary perineal repair is unsuccessful. In such cases, it is desirable not to operate too soon. We recommend the patient to seek admission three to four months after delivery, as by that time the tissues will be sufficiently clean and healthy and not too friable to allow of another operation.

Central Perineal Rupture. This is a somewhat rare accident in precipitate labour. The head is driven down and, instead of the perineum tearing from the posterior commissure, the tissues give way in the central portion midway between the rectum and the commissure. The head may then descend through this rent.

Occasionally, when this occurs in an exaggerated form, the head has been seen to be delivered through the rectum.

In repairing this form of laceration where the rectum is involved, it is well to divide the narrow bridge between the laceration and the commissure, thus making it a complete tear before suturing.

If, however, the rectum has escaped it may in some cases be sufficient to suture the central tear in the perineum.

Where perineal lacerations are associated with considerable œdema and bruising of the soft parts, it may not be desirable to suture the rent immediately after delivery for fear of infection and sloughing of the parts. In such cases the sutured perineum is not likely to heal and indeed the chances of infection are increased. Healing occurs by granulation and it is best, under such circumstances, to advise the woman to undergo a perineal repair at a later stage.

Lacerations of the Vagina. Lacerations of the vagina are not uncommon and more generally occur in forceps deliveries and breech extractions. Particularly in cases of forceps application in occipito-posterior positions are such lacerations likely to occur. They are more frequent where the head has to be rotated artificially and are severe if the forceps slips on traction. Sometimes vaginal tears are due to the symphysis pubis giving way or to the separation of the pubic bones in a pubiotomy. Such tears may involve the urethra and the bladder. Vaginal tears may also result from defects in the instrument. The forceps blades may not be sufficiently smooth and rounded and thus act as cutting blades; or defects in the manner of fixing the axis traction rods may occasionally be responsible for such tears.

A more severe form of trauma may result after delivery in cases where the head has been jammed in the pelvis for a long time. In such cases the necrosis resulting from the prolonged pressure of the head and possible superadded infection may produce sloughs of the vagina which, when they separate, may lead to fistulous tracts communicating either with the bladder or with the rectum. Vaginal tears may be either longitudinal or transverse and when involving the fornices may extend to the pelvic cellular space. The chief danger of vaginal tears is infection, which in some cases may result in a severe septicæmia. Slight lacerations of the vagina do not require any particular treatment, but if there is an extensive tear it is necessary to suture it. There is usually an associated perineal tear and the repair of the vagina is combined with the perineal reconstruction.

Lacerations of the Cervix. The cervix after parturition is never the same as before. Minor lacerations occur in practically

all cases. But deep tears are due to causes which are largely preventable.

The chief causes of cervical lacerations are:—

(1) Rapid delivery of the foetus by the natural powers or in assisted labour, when the cervix is not completely dilated. Thus in precipitate labour the cervix may be torn. More often, however, it is the accoucheur who is at fault. Serious injury to the cervix may occur by applying forceps when the cervix is not fully dilated or, by extracting a breech presentation with an imperfectly dilated cervix.

(2) Rigidity of the cervix. This may in some cases be due to natural causes. More often it is due to diseased conditions. In elderly primiparæ the cervix tends to be more rigid; in some cases, where the cervix has been lacerated previously or has been the seat of extensive operative procedure, the resulting scarring may give rise to a rigidity which inevitably leads to a tear. If every case of labour is attended to with care and delivery attempted only after complete dilatation of the cervix, that is, after its effacement and retraction above the presenting part, serious lacerations will be far less common. In some cases, however, delivery may have to be effected before dilatation of the cervix is complete. This may be due either to rigidity of the cervix, which does not allow of the natural effacement of the cervical canal, or to the necessity for expediting the delivery in the interests of either the mother or the child. The methods of dilating the cervix under such circumstances have been referred to elsewhere. One such method is to incise the cervix according to Duhrssen's method, for these incisions can be more easily controlled and properly sutured after delivery.

Occasionally the rent in the cervix may extend upwards and involve the lower uterine segment, opening up the pelvic cellular space and even the peritoneal cavity. These extensive tears will be more fully described under "rupture of the uterus."

A complication that may sometimes occur is a circular tear or "avulsion of the cervix." This may be due to a faulty application of the forceps where the cervix is caught between the blades and the head, so that when traction is applied a whole ring of the cervical tissue comes off. In some cases it may occur spontaneously when the uterus suddenly forces the head down.

Cervical tears are generally discovered after delivery as they cause hæmorrhage which, though not necessarily profuse, is continuous. Tears of the cervix are much more liable to occur in cases of placenta prævia, where owing to the low implantation of the placenta, the tissues are sodden and soft.

Prognosis. Small tears of the cervix usually heal without trouble, but the risk of infection should always be borne in mind. Larger tears, however, may immediately give rise to severe hæmorrhage and later produce extensive scarring which extends to and involves the vaginal vault. They lead to ectropion and

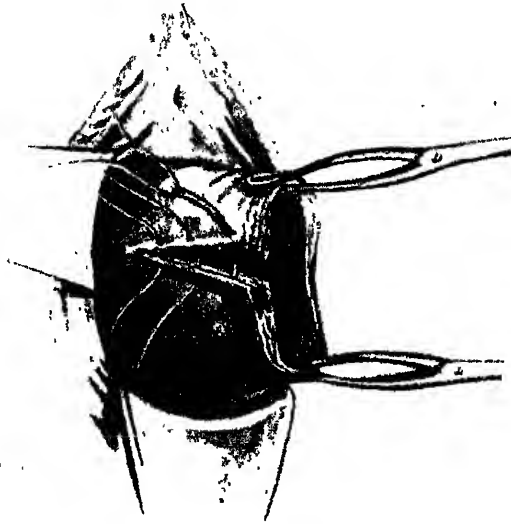


FIG. 163.—Suturing of cervical tear after delivery.

persistent cervicitis, which may predispose to malignancy. In some cases sterility, repeated abortions, premature labour or dystocia may occur as late sequelæ of old lacerations. When the tear extends into the parametrium, pelvic cellulitis and infection of the uterus and other complications may result.

Treatment. In minor tears not giving rise to any severe hæmorrhage it is not desirable to meddle with the cervix immediately after delivery. While there is no doubt that such small lacerations may give rise to a certain amount of chronic cervicitis, the danger of puerperal infection is great through interference soon after delivery, it is much better to treat such cases some weeks or months later, rather than examine them soon after delivery as a matter of routine, to detect cervical lacerations. Our practice has been only to interfere in those cases where a definite, fairly severe laceration of the cervix is known to have occurred, or in cases of postpartum hæmorrhage obviously traumatic in type.

In such cases the parts should be examined under strict aseptic precautions by inserting a posterior vaginal speculum and the cervix held by a couple of sponge forceps. We do not advocate

the use of volsella under such circumstances, as they lead to tears and cut through the soft cervix.

The two torn edges are brought into close apposition by means of interrupted catgut sutures, avoiding the endocervix.

Occasionally the tear of the cervix may lead to severe bleeding, which makes it impossible easily to see the laceration. Under such circumstances feel for the laceration and pass a suture just above the apex of the tear on each side and tie these, when the greater part of the bleeding will be arrested and the further steps in the repair can be more easily undertaken.

The after-care of such cases is also important. If there is evidence of infection the vagina may have to be douched daily. It is desirable after a couple of weeks to examine the patient to see if healing has occurred, and if the cervical lacerations have not healed properly the patient should be advised to seek further treatment after three months.

RUPTURE OF THE UTERUS

This is one of the most serious complications that may occur during pregnancy or in labour. In the majority of cases, the accident is due to neglect during labour. In a few instances, however, it has occurred without any appreciable cause. This is called *silent rupture* of the uterus.

Rupture of the uterus may take place at three distinct periods:—

- (a) During pregnancy.
- (b) Early in labour.
- (c) After prolonged labour.

Rupture of the Uterus during Pregnancy. During pregnancy, spontaneous rupture of the uterus may sometimes occur in the last trimester. When rupture occurs in the earlier periods of pregnancy, it is generally due to pregnancy in a bicornuate or an infantile uterus. Rarely it may be due to the invasion of the uterine wall by foetal elements as in hydatidiform mole.

In the later months of pregnancy rupture may be caused by several factors:—

- (1) Diseased condition of the uterine musculature.
- (2) Weak uterine scars as a result of previous operations on the uterus.
- (3) Traumatic causes from a fall or other injury.

Cases are reported where, after a previous Cæsarean section, the scar has given way in the later weeks of pregnancy. Occa-

sionally a uterus which has been previously damaged by perforation either with a curette or a sound may in a subsequent pregnancy rupture owing to the weakness of the cicatrix formed. Where operations, such as myomectomy, have been performed on the uterus, the resulting scar may give way during pregnancy or labour. In some cases, either due to previous diseased conditions of the uterus or sepsis associated with previous labours, the musculature becomes thinned out and deficient and yields to the increasing tension.

Traumatic causes are generally due to injuries, falls or blows, and are more frequent in *multiparæ* than *primiparæ*. Cases are not infrequent where rupture has taken place as a result of goring by a bull or other animal.

Rupture when pregnancy occurs in an infantile uterus is most rare, as in women with infantile uteri sterility is the rule. When pregnancy does occur in a uterine horn rupture may take place, and then the phenomena are akin to those of a ruptured ectopic gestation.

In hydatidiform mole the chorionic villi may penetrate deeply into the uterine wall and perforate it or cause considerable damage to the musculature so that rupture occurs in a later pregnancy. Apart from these causes, rupture has been known to occur without any ascertainable cause. When rupture occurs spontaneously during pregnancy the tear is almost invariably in the upper portion of the uterus. This is in striking contrast to what occurs during labour, when the rupture is generally limited to the lower uterine segment.

Rupture of the Uterus early in Labour. Many of the conditions which favour rupture of the uterus in the later weeks of pregnancy may also be responsible for rupture early in labour. There also the tear is more likely to involve the upper uterine segment, starting at the point where the uterine musculature is weakest.

The result of the rupture in these two groups is to permit the escape of the foetus partially or wholly into the abdominal cavity and to give rise to severe intra-abdominal bleeding. Occasionally the term *silent rupture* is used to denote the condition where the uterus ruptures with no premonitory signs or symptoms of threatened rupture.

Rupture of the Uterus after Prolonged Labour. During labour rupture of the uterus may occur spontaneously or as a result of operative interference. In the majority of cases where rupture occurs as a result of operative interference the conditions favouring rupture may be present already. This will be evident from study of the condition of the uterus in cases of prolonged labour, where the need for operative interference is greatest.

Ætiology. The factors concerned in rupture of the uterus are:—

- (1) Predisposing causes, and
- (2) Exciting causes.

Predisposing Causes. Conditions which produce a weak uterine musculature; fatty or hyaline degeneration; syphilis; pressure necrosis due to prolonged labour; scars from previous operations on the uterus; septic conditions in previous labours and inflammatory conditions of the muscle; overdistension of the uterus; congenital anomalies, etc.

The mechanical factors concerned are those which produce a relative disproportion between the foetus and the pelvis. These may be due to contraction of the bony pelvis, malpresentations such as shoulder, face, brow, compound; malpositions as in occipito-posterior; excessive development of the foetus; deformities of the child such as hydrocephalus, hydrothorax, monstrosities, tumours obstructing the course of delivery; anomalies of the soft parts such as rigid cervix or perineum; growths of the vulva; sacculations of the uterus; pendulous abdomen, etc. In fact, all factors that tend to prevent the descent of the foetus and obstruct it at any stage in its progress through the birth canal are likely to lead to rupture of the uterus.

The exciting causes of rupture of the uterus may be contractions of the uterus in the presence of mechanical obstruction to the descent of the foetus, or direct trauma from operative interference. This includes rupture of the uterus resulting from the extension of cervical tears due to attempts at artificial delivery before the cervix is fully dilated. The improper use of ecbolics such as pituitary extract during the course of labour has not infrequently resulted in rupture.

Mechanism of Rupture. This will be evident from a consideration of changes in the uterus in cases of prolonged labour. During labour, the uterus becomes well differentiated into two portions, physiologically separated by a circular ring of tissue which when exaggerated is termed "retraction," or "Bandl's ring". The upper two-thirds of the uterus contracts and thus help to expel the foetus, while the lower third undergoes dilatation and elongation, and progressively forms a canal through which the foetus is finally expelled. As the upper uterine segment progressively contracts and retracts, its wall becomes thicker and thicker. The lower uterine segment, on the other hand, dilates and its wall becomes progressively thinner, so that at the junction of the upper and lower uterine segments a distinct demarcation ring—Bandl's ring—can be made out. Such a line of demarcation must

necessarily be present in all cases of labour; but in cases of prolonged labour, as the capacity of the upper uterine segment is gradually diminished by retraction of its muscle wall, the greater part of the fœtus has got to be accommodated in the lower uterine segment, with the result that



FIG. 164.—Ruptured uterus. The tear is in the posterior wall of the lower uterine segment.

this segment is dilated much more than usual and its walls thinned out. This increased dilatation of the lower uterine segment naturally results in its upper margin progressively rising higher and higher. It is in consequence of this phenomenon that Bandl's ring can be appreciated at a higher level in cases of prolonged labour. Therefore the height of the Bandl's ring serves as an indication of the amount of stretching that the lower uterine segment has undergone and consequently of the thinness of its musculature. The higher the Bandl's ring is above the symphysis the greater is the dilatation of the lower uterine segment and the thinning of its wall. In the ordinary course of events, in the absence of obstruction, the fœtus passes through the pelvic canal either spontaneously or with some assistance from the accoucheur and is born before a dangerous degree of dilatation and thinning of the lower uterine segment can take place. If, however, the path

is not watched carefully or if proper medical assistance is not available, and the obstruction is not overcome by the uterine contractions, a stage will be reached when the lower uterine segment cannot dilate any further, and with the continued and increased efforts of the uterus forcing the foetus more and more into the lower uterine segment the musculature gives way at its weakest part. It is for this reason that rupture in cases of prolonged labour is always confined to the lower uterine segment.

The tear may be transverse or oblique, may involve the whole wall or only a portion of it, leaving the peritoneum intact.

When rupture takes place there is necessarily a certain amount of intra-abdominal bleeding. As a result of the rupture the foetus may escape partially or wholly into the abdominal cavity. This will depend naturally upon the degree of the tear, and in some cases where an extensive tear has occurred the whole of the foetus and the placenta may be found free in the abdominal cavity. In other cases a limb of the foetus may escape; in others, again, although a tear is present, no part of the foetus escapes from the uterus. Occasionally the tear may extend into the pelvic cellular tissue and may open up the broad ligament on either side.

When hæmorrhage takes place, the blood may be retained in the abdominal cavity, or some of it may escape through the vagina. But the external bleeding is never profuse and it may not occur if the presenting part is jammed in the pelvic cavity. When rupture occurs usually the presenting part recedes.

Varieties. Rupture of the uterus may be complete or incomplete. It is said to be complete when all three coats including the peritoneum are involved; whereas in cases of incomplete rupture the peritoneum is generally intact and only a portion of the musculature gives way.

Signs and Symptoms. These vary considerably. In cases of rupture occurring during pregnancy or early in labour the patient



FIG. 165.—Rupture lower segment due to congenital hypertrophic elongation of cervix.

may experience a sharp, sudden abdominal pain, and signs and symptoms of shock and collapse supervene. In other cases the patient may complain of some pain and general malaise; grave symptoms may not develop till much later when infection has occurred.

In cases of rupture following prolonged labour the signs and symptoms of prolonged labour precede the rupture. The patient has been a long time in labour, the membranes have ruptured, the retraction ring is easily palpable and the round ligaments stand out prominently. There is severe pain and tenderness over the region of the lower abdomen and the contractions of the uterus may be very frequent or even continuous. The patient has got an anxious look and is restless and the associated signs of prolonged labour are manifest, the vagina being hot and dry, the presenting part fairly high up with a large caput and signs of foetal distress are present. At the height of a contraction rupture occurs, when the characteristic picture is complete. There is a sharp, acute pain, with a sudden cry from the patient, followed by immediate signs of shock and collapse due to internal hæmorrhage. After rupture the patient may feel a certain amount of relief as the uterine contractions cease. External hæmorrhage may sometimes occur but is not constant. Shock and collapse become more prominent; the pulse is small and rapid; the patient usually vomits. The presenting part often recedes from the pelvis and it will be noticed that on abdominal palpation the foetal parts, particularly the limbs, are very easily palpable and the contour of the uterus is changed. If the foetus has escaped into the abdominal cavity it will be easily felt through the thin abdominal wall and the contracted upper uterine segment may be felt as a hard mass lying alongside the foetus. If the patient is not immediately attended to the terminations are either rapid death from collapse due to hæmorrhage and shock, or delayed death from peritonitis with septicaemia.

Diagnosis. This is not difficult in most cases. It is important to recognise the condition of threatened rupture apart from the actual rupture.

Threatened Rupture. In such cases the following important signs and symptoms will be noted :-

(1) The patient is restless and anxious with a slightly elevated temperature.

(2) The contractions of the uterus are strong and recur very frequently. They may be continuous, that is, tetanic contraction.

(3) The contour of the uterus is characteristic. A thick hard mass above with a fairly thin, stretched-out lower portion; while between the two, Bandl's ring can be easily made out. This will be noted at a much higher level than usual, running obliquely

across the abdomen, and it may even be as high as the umbilicus. The round ligaments are hard and stand out prominently as tense cords. The foetal parts cannot be recognised on palpation through the tonically contracted uterine wall. There is no foetal heart audible as circulation through the placental site has been stopped by the continuous contraction of the muscular fibres. The bladder may be distended. Vaginal examination reveals the large caput, the dry and hot vagina, with the presenting part more or less jammed in some portion of the pelvis, or still high up above the brim. These signs and symptoms should at once suggest the possibility of threatened rupture and should put the obstetrician on guard.

Actual Rupture. The history given is significant. The patient will complain that at the height of a severe pain she suddenly felt something giving way inside followed almost immediately by a feeling of relief. On examination the patient is found in a condition of shock and collapse; pulse rapid and thready; temperature may be subnormal; uterine contractions are now absent; signs of intra-abdominal hæmorrhage may be elicited, the foetus is now easily palpable underneath the abdominal wall; general tenderness over the whole abdominal region may be present; the vaginal findings are similar to those in threatened rupture, except for the fact that the presenting part may have receded. It may be possible to feel the rent when it has extended low down or manual intra-uterine exploration is made under anæsthesia, and in some cases portions of the intestine prolapsed through the rent may be palpable.

Differential Diagnosis. In typical cases little or no difficulty is experienced in the diagnosis of this condition. Occasionally, in cases of prolonged labour, it may be difficult to decide whether the uterus is threatening to rupture or has actually ruptured. Not infrequently the fact of rupture having occurred can be elicited only after delivery has been completed, when a thorough internal examination may reveal the presence of the rupture, or failure to express the placenta and the deterioration in the general condition of the patient may rouse suspicion. This difficulty is likely to be experienced more in those cases where the foetus has not escaped into the abdominal cavity or the rent is proportionately small.

It is more difficult to differentiate between complete and incomplete rupture of the uterus. Not infrequently incomplete rupture of the uterus is not diagnosed until later in the puerperium, when signs of peritonitis suggest this possibility.

Other conditions with which rupture of the uterus may occasionally be confused are concealed accidental hæmorrhage and secondary abdominal pregnancy.

Traumatic Rupture. This is the result of some injury. Rupture as a result of falls, injuries, etc., has already been referred to. More frequently perhaps traumatic rupture occurs in the course of delivery, when the obstetrician with an imperfect realisation of the extent of the stretching of the lower uterine segment attempts an internal podalic version late in labour. It may also occur in forcible attempts at extraction of the head or shoulders especially when the cervix is not fully dilated.

Occasionally, during the introduction of the blades of the forceps, if care is not taken, the blade may lacerate a portion of the stretched-out lower uterine segment. The clinical features are similar to those of spontaneous rupture.

Prognosis—Foetal. This is bad as the foetus generally dies at the time of rupture or soon after.

Maternal. The prognosis for the mother is very grave. There are the serious risks of shock and hæmorrhage and of sepsis, peritonitis and general septicæmia.

The prognosis in cases of traumatic rupture is perhaps more favourable than in rupture after prolonged labour, provided the diagnosis is made immediately and proper treatment adopted.

Treatment—Prophylactic. The prophylactic treatment of this condition is by far the more important, as with proper care such a catastrophe should not occur. Efficient antenatal care which includes the diagnosis and correction of malpresentations, the recognition and determination of the degree of any disproportion, or any defects of the uterus due to previous disease or operation, will go a long way to ward off the possible occurrence of rupture. If every case is carefully studied, the extent of the disproportion correctly estimated and labour watched carefully it ought to be possible sufficiently early to determine whether labour can terminate spontaneously without risk, or some assistance is required. In prolonged labour it is imperative that the case should be thoroughly investigated. All malpresentations should be corrected, particularly shoulder, brow or compound. Where the woman is particularly shoulder, brow or compound. Where the woman is seen late in labour, with signs suggestive of threatening rupture, the most conservative method of delivery should be adopted immediately. In the majority of cases the foetal heart is inaudible, so that the treatment is entirely directed to saving the mother. Thus, in cases of neglected shoulder presentation, decapitation is indicated; in cases of brow, mento-posterior or neglected occipital posterior positions, craniotomy may be the operation of choice; in cases of compound presentation, if the foetal heart is not audible, craniotomy had better be performed. Cases of hydrocephalus should be delivered after perforation of the head.

Curative Treatment. The factors to be taken into account in determining the line of treatment to be adopted are :—

- (1) The condition of the patient when seen.
- (2) The condition of the foetus.
- (3) Whether the rupture has occurred during pregnancy, early in labour or late in labour.
- (4) Whether it is spontaneous or the result of operative interference.
- (5) Whether in consequence of the rupture the foetus has escaped into the peritoneal cavity.
- (6) Whether the rupture is complete or incomplete.
- (7) The particular causative factor of the rupture.
- (8) The surroundings of the patient and the facilities available for treatment—whether hospital treatment is possible.
- (9) The experience of the obstetrician concerned.

It will be seen from the above that a large variety of factors may be associated with a particular case and the final decision as to the mode of treatment should be based upon a correct appreciation of these factors.

Among the methods of treatment that are possible may be mentioned :—

- (1) Laparotomy with complete removal of the uterus—total hysterectomy.
- (2) Laparotomy with supravaginal hysterectomy.
- (3) Laparotomy with repair of the tear.
- (4) Delivery through the vaginal route followed by laparotomy and hysterectomy or repair.
- (5) Delivery through the vaginal route with plugging of the rent in the uterus and vagina.
- (6) Marsupialisation of the ruptured uterus.

It has been suggested that if the child is alive, laparotomy should be immediately performed and after removal of the foetus, the uterine tear should be sutured or supravaginal or total hysterectomy performed. It must be confessed that the possibility of obtaining a live child is greater in traumatic rupture and in rupture occurring during pregnancy. We have never met with a case where the foetus was alive when rupture of uterus followed prolonged labour. The next question to decide is, if the foetus is dead and rupture has taken place after prolonged labour, what mode of treatment should be adopted? There are two conditions which have to be taken note of: (1) the foetus may be completely within the uterus, or it may have escaped partially

or wholly into the abdominal cavity. (2) The general condition of the patient. The ideal method of treatment in such cases, particularly if the foetus has escaped into the peritoneal cavity, is to open the abdomen, remove the foetus and perform a total hysterectomy. It is impossible to suture the rent of the uterus that has ruptured after prolonged labour, owing to the irregularity of the tear and the extensive damage to the musculature. On the other hand, cases do occur where the patient cannot stand an immediate laparotomy with total hysterectomy.

Treatment of Spontaneous Rupture of the Uterus during Pregnancy. If the rupture is diagnosed early, the condition of the patient may be favourable for an immediate laparotomy. The child should be delivered by enlarging the tear in the uterus sufficiently by an incision. The question arises whether the uterus may be saved by suturing up the rent. In the majority of cases, as a rent will be in the area of a previous scar, and as the musculature will be fairly healthy, such a repair of the rent can be made after excision of the scar tissue, so as to bring muscular edges together. Bruising of the musculature is not likely, and the chances are that primary union will take place. If, however, the laceration is irregular, it may be necessary to perform a hysterectomy either supravaginal or total, particularly in multiparous women.

Treatment of Rupture of the Uterus early in Labour. In these cases also the tear is similar to the one that occurs in the later weeks of pregnancy. An immediate laparotomy and, if necessary, extraction of the foetus through a uterine incision should be performed. The method of dealing with the rent is similar to what has been advised in cases of rupture in the later weeks of pregnancy.

Treatment of Traumatic Rupture of the Uterus. In the majority of cases this is a result of operative procedures, and should be diagnosed as soon as it occurs. We have referred to the importance of prophylactic measures, but if a rupture does take place, the most satisfactory method of treatment is to perform an immediate laparotomy. After the delivery of the foetus, the question of dealing with the uterine rent has to be considered. If there is a clean tear, it may be possible to suture it up. If, however, in a case of prolonged labour, consequent upon internal podalic version or application of forceps, a large rent has occurred, and considerable bruising of the tissues is already evident, one must consider the desirability of performing a hysterectomy. Total hysterectomy is preferable in all such cases as it removes the heavily infected cervix, unless the condition of the patient is

such as to make it necessary to resort to the less extensive supravaginal hysterectomy.

Treatment of Rupture of the Uterus after Prolonged Labour. By far the majority of cases of rupture are due to this cause. These will become increasingly infrequent if the patient is under proper care and watched efficiently during the second stage of labour. The majority of cases dealt with, however, are cases where rupture has already taken place, while in most of them the rupture may be diagnosed before the delivery of the foetus, in some cases it is not possible to recognise the rent till after the child has been delivered.

A point of some significance which has been referred to in an earlier chapter is the possibility of a Bandl's ring forming on the posterior wall of the uterus, instead of on the anterior wall. The rent may in such cases be in the posterior surface of the uterine wall and may not therefore give rise to the same signs as when the rent is on the anterior wall. The escape of the foetus into the abdominal cavity is also much less likely when the rent is posterior. In such cases, after delivery of the foetus *per vaginam*, the placenta may not be expressed and other signs and symptoms suggest the possibility of a tear. It is necessary, under such circumstances, to verify the fact by a careful intra-uterine examination.

Rupture of the lower uterine segment by extension from tears of the cervix, generally during the process of delivery, should be treated along the general lines indicated above.

When the Tear is recognised before the Delivery of the Foetus. The question in these cases is the mode of delivery, whether it should be undertaken by the abdominal or the vaginal route. This will depend upon whether the foetus has escaped into the abdominal cavity or not. Where the foetus has only partially escaped into the abdominal cavity it may sometimes be easy to extract it by the vaginal route. In cephalic presentations perforation and extraction with forceps may be accomplished. In breech presentations the feet may be seized, the foetus extracted by traction with perforation of the after-coming head, if necessary. Where, however, the whole foetus has escaped into the abdominal cavity it is not desirable to attempt to extract it by the vaginal route, as this procedure will increase the uterine tear and cause a greater amount of shock and hæmorrhage. Wherever possible, without increasing the risks of extension of the tear, it is desirable to deliver the foetus through the vaginal route in the most conservative manner. The delivery of the foetus by the abdominal route in cases where a portion of it is jammed in the pelvis involves greater chances of infection of the general peritoneal cavity. Excepting, therefore, in those cases where the child is wholly in

the abdominal cavity, or where so much of the foetus has escaped through the rent as to make it inadvisable to attempt to deliver it from below, we prefer first to deliver the foetus through the vaginal route, and then decide as to the best method of dealing with the rupture.

Selection of the best method of dealing with the rent depends upon the following factors:—

- (a) The condition of the patient.
- (b) Her surroundings.
- (c) The facilities available.

There are two methods of treatment that may be adopted in such cases, (a) radical and (b) conservative. In institutions generally, and wherever it is possible, the radical method may be adopted. This consists in a laparotomy being performed, followed by a hysterectomy, preferably total. The first thing to be done after laparotomy is to remove the foetus, if necessary by enlarging the rent in the uterus to allow of the foetus being easily removed. Thereafter a total hysterectomy is the best procedure. The chances of infection are so great, the cervix itself being bruised and infected, that it is not desirable to leave the cervical stump. In rare cases it may perhaps be safer to perform only a supravaginal hysterectomy, in view of the condition of the patient.

Occasionally it may be possible to suture up the uterine rent, particularly if it is small and the edges are not very ragged.

Conservative Treatment. This method may be resorted to when facilities are not available for laparotomy and subsequent hysterectomy, as in cases where treatment has to be carried out at home, or where the condition of the patient is so unsatisfactory that she cannot stand the radical line of treatment. In the tropics, where cases of rupture of the uterus from prolonged labour are by no means uncommon, and where patients are generally brought from villages several miles away, it is often disastrous to attempt the radical line of treatment, in view of the critical condition of the patient. In such cases we adopt the conservative line of treatment as being the only line possible and not infrequently with satisfactory results.

Where conservative treatment is adopted the foetus is delivered through the vaginal route by one of the methods already described and, in the most conservative manner—perforation, decapitation and extraction being generally adopted. The placenta is then removed manually. Sometimes gentle traction on the cord may help to extract the placenta which has separated and is lying loose near the rent. After the placenta has been removed an injection of pituitary extract and ergometrine is given and plug

ging of the rent in the uterus and vagina carried out. In the majority of cases we prefer a tight plug in the lower uterine segment and vagina. The object of the plug is twofold: by compression it prevents the possibility of any fresh hæmorrhage occurring from the rent, and by occluding the tear it prevents prolapse of any of the contents of the abdomen. Not infrequently portions of omentum or loops of intestines tend to get prolapsed. A long strip of gauze soaked in saline is generally used for plugging and the pack is usually left *in situ* for twenty-four hours. During this period the patient is treated for shock and collapse. At the end of the twenty-four hours the gauze is gently removed and a fresh plug put in loosely, so as to cover the rent. These pieces of gauze are removed at the end of every twenty-four hours for the next two or three days.

The conservative method of treatment in suitable cases has yielded better results than the radical method. The patient has, however, to surmount several dangers. The immediate shock and collapse may sometimes prove fatal, but if she recovers from them within twenty-four hours, she has got a fighting chance.

The other complications that may supervene are:—

- (1) Sepsis with possible peritonism and general peritonitis.
- (2) Secondary hæmorrhage.

The patient is generally placed in Fowler's position and carefully watched during the next forty-eight hours for signs of peritonitis. If she survives this danger the obvious risks of uterine sepsis need not be elaborated. The remote danger of secondary hæmorrhage occurs a week or ten days afterwards. Sometimes it may occur as late as the third or fourth week after delivery. It is generally dealt with by tight vaginal plugging and treatment given for the condition of collapse. We have had a mortality of about 50 per cent. by the conservative method.

Marsupialisation of the Uterus. This has been tried in some cases where the tear is favourably situated anteriorly. The tear in the uterus is sutured up to the margins of the abdominal wound to allow of free drainage of the uterine cavity to the outside.

Care during Subsequent Pregnancy. A question that arises is, what should be the subsequent mode of management of such cases, in view of the danger of a rupture at a succeeding pregnancy? This will depend upon the nature of the puerperium. Where the patient has had a stormy convalescence owing to sepsis, salpingitis, pelvic cellulitis, etc., the chances of pregnancy are remote, as the tubes are occluded by adhesions and in such cases

one need not worry. In other cases, however, where the convalescence has been more favourable an attempt should be made to visualise, by lipiodol injections and skiagram, the condition of the uterus and the tubes. If the tubes are patent and pregnancy should result the patient should be appraised of the possibilities of a rupture, and should be advised to seek institutional treatment sufficiently early in the last trimester of pregnancy so as to be kept under continuous observation. It is probably safer to perform a Cæsarean section at term instead of allowing the woman to go through labour by the natural passages.

CHAPTER XLIII

ASPHYXIA NEONATORUM

So long as the foetus is *in utero* it is supplied with oxygen from the maternal circulation through the placenta. Immediately after it is born, the respiratory centre is stimulated and the child begins to breathe and cries out lustily. The gradual increase of carbon dioxide in the foetal circulation during the second stage of labour is the factor which helps to stimulate the respiratory centre.

In some cases, however, the child does not breathe immediately after birth and it is then said to be in a state of asphyxia. There are two varieties of asphyxia:—

- (1) Asphyxia livida, or blue asphyxia.
- (2) Asphyxia pallida, or white asphyxia.

The causes of asphyxia are many, and among the chief factors responsible may be mentioned:—

(1) Interference with the supply of blood to the foetus by pressure on the umbilical cord, or because of faulty placental circulation. Pressure on the umbilical cord may result from prolapse of the cord, the cord being nipped between the presenting part and the maternal pelvis, true knots of the cord, twists of the cord, or loops of cord round the neck or limbs of the foetus becoming tightened, and occasionally from faulty attachment of the cord as in velamentous insertion. The placenta may be compressed in cases of prolonged labour, or in cases of tonic contractions of the uterus. In antepartum hæmorrhage, the placental circulation may be diminished or stopped.

(2) Direct injuries to the foetus. This most often occurs in assisted delivery and is due to excessive compression of the head. In forceps deliveries and in extraction of the after-coming head, pressure may be so great that it involves serious compression of

the vital centres, or causes intracranical hæmorrhage. In such cases the child is usually born in a state of severe asphyxia pallida.

(3) Premature respiratory efforts by the foetus. This may occur in cases of breech delivery, the child attempting to breathe before delivery of the head, thus sucking in mucus and liquor amnii.

Asphyxia livida. Here the child is dark blue in colour, the skin is cyanosed, the muscular tonus is not lost and cutaneous reflexes are present, the muscles are fairly firm and the sphincters are active. The cord is full and the heart beats strongly. The child may occasionally make an attempt to breathe. These cases respond readily to treatment and the prognosis is therefore good.

Asphyxia pallida. Here the child is pale. The muscles are flaccid; the tonus is lost; the jaw is relaxed; the sphincters do not act. The cutaneous reflexes are absent. There is no attempt at respiratory movements and the cord is collapsed or pulsates feebly and the heart-beats are rather feeble.

The chief points of difference between asphyxia pallida and livida are the absence of muscular tonus and the loss of reflexes in the pallid type. If prompt treatment is not undertaken the heart may fail and respirations never become fully established.

The prognosis in white asphyxia is grave.

The signs of threatening asphyxia while the foetus is still *in utero* are:—

(1) Variations in the rate and rhythm of the foetal heart, the rate becoming either very fast or very slow. Above 160 per minute or below 100 per minute are evidences of foetal distress.

(2) Tumultuous movements of the foetus *in utero*.

(3) Passing of meconium unmixed with liquor amnii in cases other than breech presentations.

(4) Excessive moulding of the head or a large caput succedaneum in cephalic presentations.

We have already referred to the fact that the last is a particularly grave indication of the likelihood of white asphyxia developing after birth; and even in the absense of any of the other indications we would advocate immediate delivery if a large caput is present, in the interests of the child, provided it is safe to do so from the mother's point of view.

Treatment—Prophylactic. This is by far the most important part of the treatment, as by prophylactic measures it is possible to prevent the onset of asphyxia after the child is born. During labour the condition of the foetus should be carefully watched from time to time; in all cases where labour has to be assisted, whether by the application of forceps or by breech extraction, or extraction after version, the accoucheur should be ready to treat

the child for asphyxia neonatorum if that develops. For this purpose the following articles are necessary:—

- (1) A table of suitable height with a small bath tub filled with hot water in which the infant can be partially immersed.
- (2) A bucket of hot water and another of cold water to adjust the temperature of the bath water.
- (3) Pieces of gauze to swab mucus from the throat.
- (4) A tracheal catheter or mucus extractor.
- (5) A hypodermic syringe.
- (6) Preparations of adrenalin, Scheele's fluid, lobelin, and coramine ready for hypodermic injection.
- (7) A cylinder of oxygen and one of carbon dioxide.
- (8) Brandy in a small bottle.
- (9) Tongue forceps.
- (10) Two artery forceps and scissors, sterilised and kept in antiseptic lotion, to clamp and cut the cord immediately.

The prophylactic treatment consists in terminating labour, when any of the signs of foetal distress described above manifest themselves. Immediate delivery offers the best hope of preventing the development of a severe degree of asphyxia. It may, however, be stated that such delivery presupposes that the conditions are satisfactory for the immediate delivery of the child without endangering the mother. The application of forceps, or the extraction of a breech, or in suitable cases version followed by extraction, are the ordinary methods of treatment available. Occasionally it may be necessary to resort to Dührssen's incisions of the cervix before extraction of the child, when the cervix is not fully dilated.

Curative Treatment. The following routine treatment ought to be adopted in cases where the child does not breathe immediately after delivery.

As soon as the child is born its condition should be noted, and if it is a case of blue asphyxia the probability is that gentle stimulation will prove successful in establishing respiration. If the child does not breathe after birth the throat and upper air passages must be cleared of all mucus and the cord should be tied or clamped and the baby separated from the mother. Once the mucus is cleared from the throat the chest is gently compressed and in all probability the child will begin to breathe. If the child does not breathe, the baby is put in a hot bath at a temperature of 115° F., so that the whole body is immersed except the head, which is carefully supported.

If the child does not breathe even after such efforts, artificial methods of respiration are tried, and simultaneously an injection of 3 to 5 minims of Scheele's fluid is given. This fluid consists of

One minim of liquor strychnine hydrochloride,

One minim of tincture belladonna, and

Eight minims of brandy.

Instead, one of the many respiratory stimulants like lobelin or cardiac stimulants such as coramine, $\frac{1}{2}$ to 1 c.c., or camphorated oil, etc., may be given intramuscularly.

With the child immersed in the bath as described above, Sylvester's method of artificial respiration may be tried. In the majority of cases this will be quite sufficient, provided artificial respiration is attempted in a logical manner. The movements must not be repeated too frequently. Watch for spontaneous respiratory movements on the part of the foetus, and take advantage of these. Thus, the arms must be raised while the head and the lower extremities are kept stretched, and immediately after the child has attempted to breathe in, the arms are brought down and compressed against the chest so as to favour prompt expiration. If the movements of artificial respiration are made to synchronise with the attempts of the foetus to inspire and expire, the response will be far more satisfactory and prompt. A mechanical form of artificial respiration, which does not take note of the spontaneous movements of the child will do more harm by impeding such movements. Other methods of artificial respiration may be used, provided the above principle is employed.

While carrying out artificial respiration the child may be given oxygen inhalations. In cases where the cardiac action is feeble adrenalin (5 to 7 minims of a 1 in 1000 solution) may be injected directly into the heart. Another drug that may be utilised is lobelin, $\frac{1}{2}$ to 1 c.c., ($\frac{1}{20}$ grain) which is injected intramuscularly or occasionally into the umbilical vein.



FIG. 166.—Clearing the throat of mucus in an asphyxiated child.

Attempts at artificial respiration should be kept up so long as the heart continues to beat. Sometimes it may have to be kept up for two or three hours; but if the child makes no attempt at respiration and if the heart-beats stop, it is futile to expect that the child will revive.

A valuable aid to Sylvester's method of artificial respiration is tongue traction. The tongue is drawn out by means of a tongue

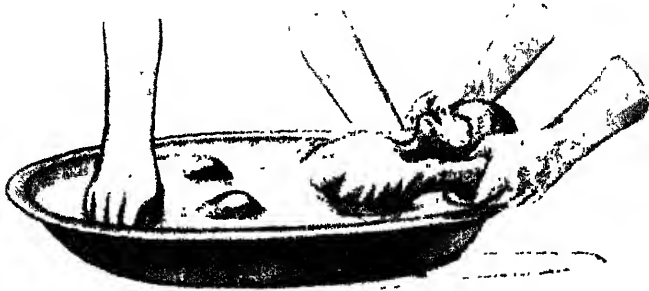


FIG. 167.—Sylvester's artificial respiration—I stage.

forceps and allowed to recede about eight to ten times a minute. This may also be done synchronously with Sylvester's method of artificial respiration.

A method of artificial respiration that can be attempted when single-handed is a modification of Marshall Hall's. The child is



FIG. 168.—Sylvester's artificial respiration—II stage.

placed on a warm blanket spread over a table with one arm raised above its head. The obstetrician stands on the opposite side and rolls over the body of the child to the opposite side and compresses the chest. The child is then brought back to its original position. These movements favour expiration and inspiration respectively, and should synchronise with the natural attempts of the child to breathe. Simultaneously with these movements, the head is kept

in an extended position, the mouth and throat frequently cleared of all mucus and traction on the tongue applied. A few drops of brandy may with advantage be rubbed into the mouth and throat and over the chest.

Other methods of artificial respiration which were at one time in vogue are —

Schultze's method of swinging the child over the accoucheur's shoulder so that when it is carried up the body is flexed and compression of the chest occurs, thus inducing expiration, and when the child is swung back inspiration is favoured. This is not a desirable method to employ in view of the shock that it produces, and also because of other disadvantages such as excessive compression of the abdominal viscera.

In *Byrd's method* the child is supported at the neck and buttocks, and the body is extended and flexed alternately, thus promoting inspiration and expiration. This is a method that is not advocated, in view of the possibilities of causing damage to the viscera.

Insufflation. This is a method that is occasionally adopted. It may be done either through a tracheal catheter or by direct mouth-to-mouth insufflation. The disadvantages of this method are many and it cannot therefore be recommended. Distension of the stomach with air, rupture of the air vesicles by too forcible insufflation and possible infection are some of the disadvantages.

In recent years the use of an inhalator with injection of lobelin into the umbilical vein has been advocated particularly in cases of white asphyxia. The lobelin serves as a chemical stimulant to the respiratory centre for the first breath. This stimulation is maintained through the inhalator which supplies the child with different percentages of carbondioxide and oxygen. The oxygen sensitises the respiratory centre and the carbon-di-oxide when present in sufficient quantity stimulates it. The mixture advocated in most cases consists of 10 to 20 % of oxygen with CO₂ and as the child revives, the CO₂ is cut down.

The After-Care of the Asphyxiated Baby

It is worth remembering that an asphyxiated child which has been revived should be watched carefully for two to three days. Occasionally secondary asphyxia may develop. In many cases the lungs do not expand freely and there may be areas of atelectasis; in others small hæmorrhage would have occurred in the intracranial region. The child should be kept warm, constantly watched, occasionally oxygen inhalations and stimulants may be necessary, and particular care should be taken in the nourishment of the baby.

If intracranial hæmorrhage is diagnosed as the cause of the asphyxia, the child must be handled very gently during the treatment. Any active artificial respiration or rough handling will increase the bleeding and result in death of the foetus. The child should not be bathed for several days. It is nursed with the head raised by a pillow, gr. i. of chloral hydrate is given in a teaspoonful of water four-hourly if there is evidence of cerebral irritation. The child cannot suck easily. Milk withdrawn from the mother's breast must be given by a spoon or pipette.

CHAPTER XLIV

ACCIDENTS AND INJURIES TO THE CHILD

THE foetus is subjected to great strain during the process of delivery and not infrequently accidents and injuries result. Sometimes death of the foetus *in utero* may occur either during pregnancy or during parturition.

Death of the Foetus during Pregnancy

The factors that may cause death of a viable foetus during pregnancy are:—

(a) Maternal factors—

Toxæmias of pregnancy.

Hyperpyrexia of the mother.

Syphilis.

Specific fevers.

Accidents to the mother, such as a fall.

Antepartum hæmorrhage.

Certain general systemic diseases, such as diabetes, chronic nephritis, etc.

(b) Abnormalities and diseases of the foetus.

There are cases where intra-uterine death of the foetus recurs at the same period of each pregnancy, generally between the thirty-fourth and thirty-eighth weeks. The factors responsible for this are still undetermined. Deficient foetal oxygenation has been considered to be one factor, while some form of toxæmia of the mother is another. If there is such a characteristic history of death of the foetus at the same time in repeated pregnancies, it is desirable in a subsequent pregnancy to induce labour before this period of gestation is reached. In some cases the administration of potassium chlorate, 10 to 15 grains three times a day, has been found useful. The drug is believed to act beneficially, by setting free oxygen which helps to properly oxygenate the foetal blood.

Where syphilis is a factor, antisyphilitic treatment must be adopted.

Intra-uterine death of the foetus tends to occur near term in cases of diabetes. Where the diabetic mother is being treated with insulin, the possibility of death of the foetus, *in utero* being due to a hypoglycæmic condition of the foetus, without any maternal signs or symptoms of hypoglycæmia manifesting themselves, deserves consideration.

Intra-uterine death of the foetus may be diagnosed by the following symptoms and signs:—

Symptoms. Languor, malaise, chills, foul taste in the mouth, feeling of weight in the lower abdomen, failure to feel foetal movements and a sense of general discomfort.

Signs:—

- (1) Cessation of growth of the uterus.
- (2) Foetal heart sounds inaudible on repeated auscultation after having been heard previously.
- (3) Palpation of the soft macerated foetal head where the cranial bones slide freely over one another.
- (4) Retrogressive changes in the breast, it ceasing to enlarge and becoming flabby and pendulous. A sign of some importance is secretion of milk which occurs two to three days after death of the foetus.
- (5) Loss of weight by the mother.
- (6) X-ray findings, particularly overlapping of cranial bones, known as *Spalding's sign*.

Death of the Foetus during Parturition

The majority of still-births are due to complications during labour. Among these may be mentioned:—

- (1) Prolapse of the cord.
- (2) Placenta prævia and accidental hæmorrhage.
- (3) Prolonged labour associated with uterine inertia, mal-presentations or disproportion.
- (4) Difficulty in delivery or faults in the mode of delivery, in cases where assistance is required.

We are convinced that not infrequently still-birth is due to the last factor, either because the obstetrician has not given enough time for the head to mould through or because of faults in technique in the delivery of the foetus. Experience is of great help in determining the time and mode of interference suited to individual cases.

Birth Injuries

During the course of delivery the foetus may be subjected to many injuries, some of which may be insignificant, while others are so pronounced that they either cause a still-birth or favour neonatal death. Among these injuries may be mentioned:—

A. INJURIES TO THE HEAD

Cephalhæmatoma. During the process of delivery a soft boggy swelling forms on the presenting part, which becomes more pronounced in cases of prolonged labour. This is known as a *caput succedaneum* and is physiological. A type of injury that occurs in some cases is known as a *cephalhæmatoma*. It may occur during delivery with forceps or in extraction of the breech,



FIG. 169.—Cephalhæmatoma.

A. Single, B. Double.

especially where there is some disproportion; occasionally it develops after spontaneous delivery. The most usual situation for a cephalhæmatoma is over one or both parietal bones. Sometimes, however, it may form over the occipital bone or one of the frontal bones. It does not appear immediately after birth, in fact it is usually first observed some hours after delivery. It is very slow in disappearing and may take weeks to do so.

A cephalhæmatoma may be distinguished from a caput succedaneum by the following points:—

Cephalhæmatoma.

May not appear at birth, but develops a few hours or even two or three days after delivery.

Is sharply limited by the sutures to a particular bone, the swelling being underneath the pericranium.

Swelling is soft and elastic; does not pit on pressure.

Gradually increases in size for some time and takes weeks or even months to disappear.

Caput Succedaneum.

Is always present at birth.

Is not well circumscribed and may be present over more than one cranial bone, the swelling being in the loose tissue of the scalp external to the pericranium.

Soft boggy swelling which pits on pressure.

Of maximum size at birth gradually gets smaller and disappearing usually in twenty-four hours.

In cases of cephalhæmatoma it is advisable to treat the condition on expectant lines. Although it may take a long time,



FIG. 170.—Section of the foetal skull showing the formation of caput succedaneum.

sometimes months, before the swelling disappears, it is not desirable to incise it as the chances of subsequent infection are great. In our experience expectant treatment has generally resulted in the gradual disappearance of the swelling, and the mother should be encouraged not to be over-anxious about the condition as by itself it causes no disability.

Bruises and lacerations are not infrequent over the vertex, especially in cases of forceps delivery.

Spoon-shaped deformity of the skull occurs where some resistance has been offered to the delivery of the head by a protruding sacral promontory and in some cases by pressure of the tip of the blades of the forceps. These spoon-shaped or gutter-

shaped depressions are generally over one or other of the parietal bones or occasionally over the frontal bone. The bones in the depressed area are usually fractured, but in some cases there may be simple indentation. They generally correct themselves in

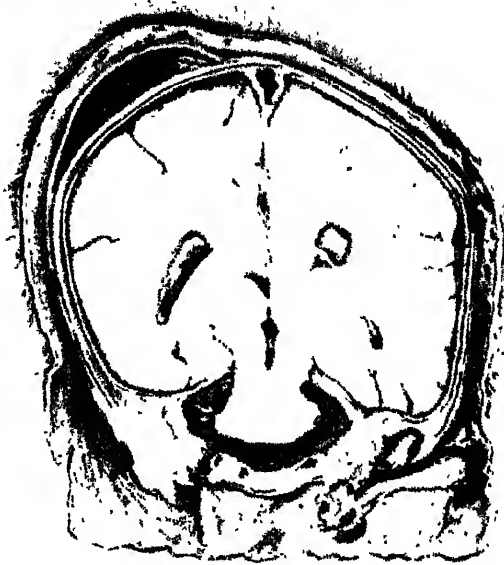


FIG. 171.—Section of the foetal skull showing the formation of cephalhæmatoma.



FIG. 172.—Spoon-shaped deformity of the skull.

course of time and do not call for any treatment unless there are signs of cerebral compression, under which circumstances surgical measures are indicated to elevate the portion of depressed bone.

Injuries to the Eyeball. These may be due to the faulty application of forceps, sometimes resulting even in evulsion of the eyeball or to careless vaginal examination in face presentation.

Fracture of the lower jaw may occur during an unskilful attempt to deliver the after-coming head.

Injuries to the throat and lacerations of the soft palate may also occur if care is not taken in manipulations with the finger in the mouth for purposes of delivering the after-coming head.

Hæmatoma of the sternocleidomastoid muscle occasionally occurs in the process of delivery of the shoulders. The hæmatoma is usually in the lower part of the sternomastoid muscle. A few fibres of the muscle may be ruptured by violent traction if combined with extreme torsion of the head. A blade of the forceps may deeply crush the muscle and lead to a myositis. The child cries incessantly, especially when handled, and torticollis may result.

Intracranial Hæmorrhage. This may result from fracture of the skull, from undue and especially sudden compression of the head, from spoon-shaped and grooved depressions of the bone or from excessive pressure exerted on the cephalic pole as a whole. Tears of the tentorium cerebelli and of the falx cerebri are not uncommon. The rupture of a cerebral or meningeal vessel may sometimes be caused by excessive overlapping of the cranial bones during head moulding. This is not infrequently the case in the delivery of the after-coming head, in forceps delivery in occipito-posterior positions and wherever excessive force is used during traction in forceps deliveries. When intracranial hæmorrhage occurs the child may be born deeply asphyxiated, or the symptoms may come on within three or four days after birth. Usually the child is restless, cries incessantly, is not able to take nourishment and later, twitchings of the muscles, convulsions, fever, cyanosis with rapid and irregular respirations due to atelectasis may manifest themselves. In severe cases the child dies during the neonatal period. If it does recover, the possibilities of complications developing later, such as epilepsy, spastic paraplegia or a form of congenital idiocy, should be borne in mind.

B. INJURIES TO NERVES

Injury to the facial nerve is about the most frequent form of birth injury to nerves. It is due to the pressure of the forceps during delivery. In the majority of cases the facial paralysis that results, is of a temporary nature, and within two or three days at the most the facial deformity disappears. If, however, the facial paralysis is due to intracranial injury in which the facial nerve has become involved, the paralysis may be permanent.

Brachial Palsy. This results from excessive traction in delivery of the shoulders. Occasionally it may be due to compression by a blade of the forceps. The paralysis that results is known as Erb's palsy. It is due to injury to the fifth and sixth cervical roots. The muscles paralysed are the biceps, deltoid, brachialis anticus, supinator longus, supraspinatus, infraspinatus, rhomboideus, subscapularis, clavicular portion of pectoralis major, serratus magnus, latissimus dorsi and teres major. As a result of this paralysis the arm assumes a characteristic position. It cannot be flexed at the elbow, raised or abducted. The movements of the wrist and the fingers are not impaired. Adduction of the arm is weak and rotation is feeble or absent. The sensation remains undisturbed, but muscular atrophy rapidly sets in. In the majority of cases, however, the prognosis is favourable, as with the recovery of the nerve roots from the effects of bruising and compression by



FIG. 173.

the exudate, the paralysis gradually disappears. Proper treatment is essentially prophylactic. Care must be taken during delivery of the shoulders to avoid too powerful traction on the head or excessive torsion of the neck. If paralysis has resulted, the arm should be carefully bandaged to the side and kept at rest for a few days after which it should be massaged daily. If recovery is delayed and permanent damage is likely, it is advantageous to keep the arm in a position of external rotation and abduction by means of a splint.

Musculospiral Nerve Paralysis. This occurs owing to the long course of the nerve, its position in relation to the humerus, and its special liability to compression. Injury to the nerve is followed by the dropping of the wrist and fingers. It is a mixed nerve, containing sensory, motor and vasomotor fibres, but the symptoms of the injury are almost entirely motor. In the upper arm the nerve supplies the triceps and the anconeus; in the forearm the supinators and the extensors and the long abductor of the thumb. The nerve is usually injured in the middle-third of the arm by a fracture of the humerus.

Treatment consists in keeping the arm at rest with the hand dorsiflexed and massaging morning and evening.

C. FRACTURE OF BONES

The bones commonly fractured are:—

- | | |
|----------------|--------------|
| (1) Lower jaw. | (3) Humerus. |
| (2) Clavicle. | (4) Femur. |

Occasionally the ribs may be involved and there may be dislocation or subluxation of the shoulder and hip-joints.

Fracture of the lower jaw occurs in cases of delivery of the after-coming head in breech presentations when the traction is applied a little too much forward on the lower jaw.

Fracture of the clavicle not infrequently results directly from trauma during delivery of the after-coming head, or occasionally indirectly from pulling on the arm or the head.

Fracture of the humerus results during the delivery of the extended arms in a breech presentation, or by traction on the axilla, when the shoulders are impacted after delivery of the head.

Fracture of the femur occurs when trying to bring down a leg in a case of extended breech.

With proper care, none of these fractures should really occur; and when they do, it is due to some faulty technique in the process of delivery. Dislocation of joints may occasionally occur on account of force exerted on the joints in the course of delivery. When fractures do occur the proper treatment for the particular fracture should be undertaken. It is advised that an orthopaedic surgeon should be consulted and the case left in his charge.

Injuries of any description generally interfere with the progress of the child during the neonatal period. Such children do not gain weight and are more prone to the diseases of the neonatal period, so that on the whole the prognosis in such cases is not so favourable.

Surgical Affections in the New-Born

Several conditions may be met with in the new-born requiring surgical treatment. Some of them require immediate treatment, while others may have to be dealt with at a later stage. The following are the more important:—

1. Imperforate anus.
2. Phimosis.
3. Fracture of the long bones.
4. Depressed fracture of the skull bone.
5. Amniotic hernia and hernia into the cord.
6. Supernumerary digits.
7. Tongue-tie.
8. Talipes (club-foot).
9. Undescended testis.
10. Harelip and cleft palate.
11. Hydrocele and inguinal hernia.
12. Pyloric spasm or stenosis.

Imperforate Anus. This condition is met with occasionally and requires in most cases immediate surgical aid. Four types of imperforate anus may be met with.

(1) Here there is a stenosis of the anus due to an incomplete rupture of the anal membrane. The condition is relieved by repeated dilatation of the anal canal.

(2) In these cases the obstruction is due to a persistence of the membrane at the anal orifice. A crucial incision into the membrane with subsequent dilatation for a few days cures the condition.

(3) In these cases the anus is absent, but there is a pouch of the rectum which may be within 1 to 4 cm. of the anal dimple.

(4) Here the anal opening and the lower rectal segment are normal, but the descending segment of the rectum ends blindly, 2 to 4 cm., above the anus.

In the third and fourth groups it is well to wait for twelve to sixteen hours after birth to allow the meconium to distend the lower bowel and the rectal pouch. The child is placed in the lithotomy position and a perineal incision is made through the site of the anus and carried upwards and backwards along the concavity of the sacrum strictly in the middle line for not more than 2 inches. In favourable cases the distended pouch with meconium will be met with. This cul-de-sac is drawn down as far as possible and opened into towards its posterior aspect. The mucous membrane is then, if feasible, stitched all round to the skin so as to leave no surface to granulate, thereby preventing

subsequent stenosis. Where no rectum is present, or where the cul-de-sac is not reached, iliac colostomy must be performed. In those cases where abnormal openings into the bladder or vagina are present, once a passage for the fæces is established through the normal channel, such openings usually close spontaneously without difficulty.

In female infants, however, if the rectum opens into the vagina and the opening is sufficiently large to allow of free passage of meconium and fæces, no immediate operation is necessary. An operation can be performed subsequently when the child is grown up.

Phimosis. In the new-born male phimosis is to a certain extent a physiological condition. Slight adhesions are always present between the glans and the mucous membrane, which gradually loosen in the course of the first few months. If, however, there is too long a prepuce or too narrow an opening it requires operative treatment. Neonatal circumcision may be performed, and the best results are obtained by a more or less simple procedure. It is important to remember that the mucous membrane should not be unnecessarily removed. The frenal artery is thus avoided and the sensory nerve endings at the frenum are preserved. To get this result the adhesions between the foreskin and the glans are first broken up with a probe, a circumcision guard is slipped on obliquely and the excess skin removed by scissors. Careful retraction of the mucous membrane is then made, and after putting in three or four fine catgut sutures to approximate the mucous membrane and the skin a dressing is applied.

Fracture of the Long Bones. It has already been stated that among the injuries met with in the new-born are fractures of the bones, in particular the clavicle, the humerus, the femur and occasionally one or other of the ribs. Fracture of the clavicle and separation of the upper epiphysis of the humerus occur most often in breech deliveries complicated with extended arms. Immediate fixation is the proper treatment of all these shoulder injuries. A simple wire splint may be utilised for this purpose. The arm is placed and maintained in an elevated position for a few days.

As regards fracture of the long bones, the essential principle of treatment is fixation and treatment in an attitude that best maintains the fragments in position. It is well to remember that union of fractured bones in the new-born is so rapid that it is only necessary to immobilise the bones for a few days instead of for weeks as in adults.

Depression of the skull bones should be treated by gentle counter pressure or by elevation of the bone with one blade of a

single tenaculum forceps. The bone is most easily raised immediately after birth.

Amniotic Hernia and Hernia into the Cord. Congenital anomalies at the umbilicus are not infrequent. Hernia into the umbilical cord may sometimes persist after birth. The umbilical opening of such a hernia is relatively narrow, and this, together with the presence of adhesions, may make reduction difficult or impossible. In amniotic hernia there is an absence of the abdominal wall around the umbilicus, the defect being replaced by amnion reflected from the cord over the abdomen and lying directly upon the peritoneum. The sac may contain the small and large intestines and even the liver. Amniotic hernia does not interfere otherwise with the development of the foetus. But the only chance of the survival of the infant, except in cases of small deficiency, lies in an immediate operation for radical cure of the hernia.

Supernumerary digits do not ordinarily call for any treatment. In cases where a digit hangs by a thin pedicle, a ligature of silk-worm-gut may be applied and the pedicle allowed to separate.

Tongue-tie. This defect is not noticed till a few months after birth when difficulties are experienced either in articulation or in the free movement of the tongue for other purposes. The frenum may be snipped, taking care not to injure the vessel and the tongue thus freed.

Talipes. This is a not infrequent deformity met with, and in most cases, if treated from birth with daily massage and manipulations, the milder cases respond and plaster splints and tenotomy may often be found unnecessary. In the more severe cases and in neglected cases surgical treatment with plaster splints are required.

Undescended Testis. The testes descend into the scrotum from the abdominal wall at about the eighth month of intra-uterine life. The gubernaculum testis assists in this process. The descent of one testis may, however, be incomplete. It may remain in the abdominal cavity most frequently, being found just within the internal abdominal ring. The most common variety of undescended testis is where it occupies the inguinal canal or lies just outside it. It is easily recognised by the absence of the testicle in the scrotum, and when present in the inguinal canal the testis can usually be detected as a small movable swelling with the scrotum on the affected side imperfectly developed.

Treatment of this condition may have to be undertaken at a later period when the child is between the ages of six and twelve years and consists in either the administration of endocrines or operation.

Harelip and Cleft Palate. These are congenital malformations of the upper lip and the bony alveolus. They may be unilateral or bilateral. A simple harelip does not interfere seriously with the infant's nutrition, but when double and especially if cleft palate is also present considerable trouble may arise, necessitating surgical treatment as a life-saving measure at a very early date. Except in those cases where surgical treatment is imperative to allow the child to take its nourishment, the usual time when an operation is performed is between six months and two years. Occasionally the defect of a cleft palate may temporarily be relieved by means of a plate fixed to the under surface of the palate so that the child may suckle or be artificially fed.

Hydrocele and Inguinal Hernia. These are not infrequent, and it is well to undertake surgical treatment when the child is a few months old.

Pyloric Spasm or Stenosis of the Pylorus. This condition may be met with in infants. It is usually associated with congenital hypertrophy of the pylorus and is probably due to prenatal causes. It occurs more frequently in male children, and the pylorus is transformed into a solid cylindrical mass about one inch in length, pale in colour and sometimes of cartilaginous consistency. It may be difficult to palpate as it often lies behind the liver, but the only certain diagnostic sign of this condition is its recognition by palpation. Symptoms commence within two or three weeks of birth. After taking food there is not much evidence of pain although the child may appear to be uncomfortable, and relief is obtained by vomiting of a projectile type. Little food appears to pass into the intestine, so that constipation is marked and the child soon wastes. The stomach becomes enlarged and after a time visible peristalsis occurs.

Treatment. Medical measures, such as lavage and dieting, are only of use during the stage when the diagnosis has not yet been finally arrived at. After this the only rational treatment is surgery. The operation that is now performed is known as Rammstedt's operation. The pylorus is brought to the surface through a short paramedian incision about $1\frac{1}{2}$ ins. in length, the pyloric sphincter is divided longitudinally throughout its length, the incision reaching well on to the stomach, where the muscular fibres shed off, but very cautiously, towards the duodenal end. The mucous membrane may project and is liable to be wounded when the incision is completed. The mucous membrane projects into the gap as a hernial protrusion and is left in this condition. Shock is likely to be severe and must be suitably combated. The results of this operation are excellent. An abundant supply of saline solution is

given both before and after the operation, which is performed under a local anæsthetic.

Erythroblastosis foetalis. (Hemolytic disease of the new-born). This condition has been recognised as a definite pathological entity occurring in the new-born. The histologic picture is characterised by the presence of numerous areas of extramedullary hæmopoiesis most noticeable in the liver and spleen; The bone marrow is also hyperactive and blood formation centres show numerous nucleated red cells. Three clinical conditions in which excess of nucleated red cells are found may also be noted. These are Icterus gravitis neonatorum, Hydrops foetalis (where there is generalised cedema in a still born foetus) and hæmolytic anæmia of the new-born.

SECTION VII

OBSTETRIC OPERATIONS

CHAPTER XLV

INTRODUCTION

It may not be out of place to sound a note of caution at the commencement of this chapter and define what the attitude of the obstetrician should be when a patient in labour is committed to his charge. Pregnancy is a physiological process and parturition should also be a physiological act, but certain unfortunate accidents are liable to occur. The obstetrician will do well to realise that nature, if left alone, can overcome many minor difficulties successfully and with a minimum of risk, and so he should allow the process of labour to be completed spontaneously if possible. The attitude of the obstetrician has been well defined as one of "masterly inactivity," and nowhere is it more necessary than in the field of operative obstetrics to keep prominently before one's mind the watchword, "never interfere unless for a definite indication." Whatever the precautions taken, however well qualified and skilful the operator may be, the obstetrician can never compete with nature in effecting a safe delivery. His active participation is strictly limited and will become less frequent with increased experience. Too, often, unfortunately, the obstetrician is forced, by the importunities of the patient or her relatives, or because of his own multifarious duties, to accelerate the pace of delivery, and in every such case his experience must make him realise the occasionally disastrous consequences that result from such inopportune interference. It is equally important to be on the alert and help when necessary, instead of waiting long in the vain hope of a possible spontaneous delivery. If such help is not given in time, the result may be disastrous to mother or child or to both.

In another direction, also a word of caution is necessary. Nowhere than in the field of obstetrics is there a greater need to keep cool and avoid hurrying the process of labour. An equable temperament, resource and presence of mind, a calm outlook and steady habits are a *sine qua non* for the success of any obstetrician.

In no branch of medicine is there a greater demand for sacrifice of personal comforts and for prompt response to a call, irrespective

of the time or the distance, than in the field of obstetrics, and it is well that the young practitioner should realise before taking up this speciality what demands will be made of him in the sacrifice of his personal pleasures and social obligations.

We shall now consider what the attitude of the obstetrician should be when contemplating an operative delivery. He should always ask himself, whenever confronted with a case which possibly requires obstetrical interference, the following three questions:—

- (1) Does the patient require obstetrical interference?
- (2) Does she require immediate interference?
- (3) If she does require interference, what is the nature of the interference she requires?

On a satisfactory answer to each of these questions depends the success of the obstetrician.

Does the Woman require Interference? The answer to this question is obvious. There are only two indications for obstetrical interference during labour. It is undertaken either in the interests of the mother or in the interests of the child; occasionally it is on behalf of both. Rarely one may have to interfere on account of foetal distress, although this may lead to some degree of increased risk for the mother. The following are examples: a patient is seen at the thirty-sixth week of pregnancy with a history of bleeding. The necessity for interference here is obvious. The bleeding must be arrested to save the life of the mother, and in some cases perhaps it will also save the life of the foetus. Again, the indications may be both for the mother and the foetus, and the case of a woman who is showing strain from a prolonged labour is one in point. Here the mother is exhausted or may be in imminent risk of rupture of the uterus, and signs of foetal distress are also evident. The sooner delivery is completed, the better it is for the mother as well as the child. Another type of case is where the indication for interference is primarily on behalf of the child. A patient in labour is found to have a prolapsed pulsating cord with a cephalic presentation. The interference in this case is primarily for the sake of the foetus, and occasionally the method adopted may necessitate an added but justifiable risk to the mother, which is of course only undertaken after due consideration of all aspects of the case. It is often true that in such a case, if labour were allowed to continue, the patient would deliver herself spontaneously, but with the certainty of a still-birth. The duty of the obstetrician is to deliver a living child with a mother as little damaged as possible in consequence of the delivery. It is no satisfaction to any obstetrician to find the mother safe but the foetus born dead. The responsibility of the obstetrician

therefore frequently immeasurably greater than that of a physician or a surgeon; it is here that the greatest amount of judgment and care are required in weighing up the respective interests of mother and child, in giving due consideration to either or both, and in coming to a wise decision as to the most appropriate method of treatment to be adopted.

Does the Patient require Immediate Interference? This is another fundamental question to be asked by the obstetrician. A great deal of damage can be done by precipitate or premature interference. It is here that experience proves such an asset; but where this is lacking, as it must be in the case of junior practitioners, it is all the more necessary to consider whether the stage has now been reached when such interference is essential. The following illustrates the point by a concrete instance. A multigravida is seen in labour, with the breech presenting and in the pelvic cavity. The cervix is about three fingers dilated. The patient may require assistance at some stage of labour, but the question is when to afford such assistance. Any premature attempt to extract the breech before full dilatation of the cervix will lead to disastrous consequences both for the mother and for the child, and therefore while the question, does she require interference, may be answered in the affirmative, immediate interference is not called for. Often owing to a slight disproportion or to a deflexion attitude of the head, or to other maternal causes such as anæmia, albuminuria, etc., one may be inclined to the view that the woman in labour may require assistance. Such assistance should, however, never be given till the question, does she require immediate assistance, is answered in the affirmative. Assistance required is only when definite indications have arisen to show that the mother or the child is in distress, or there are present signs of certain risk to the mother, unless she is promptly delivered, such as in cases of valvular disease of the heart, anæmia, certain degrees of toxæmia, or after exhausting illnesses, etc.

The third question. *What sort of interference is necessary?* also requires very careful consideration. Many factors have to be taken into account in deciding this question. The first point to be decided is whether delivery should be by the abdominal or the vaginal route; it is not always easy to decide this question; hence the necessity for test labours. When the vaginal route of delivery has been selected the nature of interference will depend upon the presentation and position of the foetus, the condition of the patient, the patient's environment and the extent of assistance available, including the experience and skill of the obstetrician in attendance. In many instances there is more than one method of

treatment possible, and in such circumstances considerable judgment is required to decide which should be adopted. Let us take, for instance, the question of the treatment of placenta prævia. Here both routes of delivery are open to us—the abdominal as well as the vaginal. In one set of cases the abdominal method may be the better, in another the vaginal; and as regards the vaginal route, some obstetricians may use Willett's forceps, while others employ a Champetier de Ribes' bag; and others again, perhaps a smaller group, select a vaginal Cæsarean section. It is essential that all the accessory factors, such as surroundings, assistance available, and experience of the operator should be taken into consideration. We cannot too strongly emphasise that it is not open to every obstetrician to adopt some of the methods that may be suggested for the treatment of different obstetrical emergencies. It is no use ignoring the fact that some methods are more suitable for institutional treatment and others for domiciliary practice; some again are safer for junior practitioners to employ, while others more difficult and complicated give brilliant results in the hands of specialists.

The Ideal Environment in which to perform an Obstetrical Operation

Unfortunately, while every obstetric operation is a surgical procedure and should therefore be practised with all due asepsis and antisepsis, the obstetrician is sometimes committed or at least expected to do difficult and complicated operations in surroundings where no surgeon would undertake a case of such gravity. It is nowadays unthinkable for a surgeon to perform an appendicectomy in crowded surroundings, with the kitchen table improvised as an operating table, with no assistant to administer the anaesthetic and with little or no adequate help. It may yet be a distant cry for the obstetrician to ask for all those amenities which a surgeon insists upon before starting an operation; a perfect obstetrical organisation, because of numerical, geographical and economical considerations may be difficult to realise. Yet it is well to remember that from the point of view of the patient's safety there is no difference between an obstetric and a surgical operation, and that both require the same rigorous care in technique, preparation of the patient and after treatment. If this ideal were kept in view it is obvious that the scope for operative delivery in domiciliary practice would be increasingly limited. We are of opinion that it is not justifiable, except in circumstances where there is no other option, for any of the major obstetrical procedures to be performed in the houses of patients. We would limit the scope

of operative delivery in domiciliary practice to the application of low forceps and occasionally to the extraction of a breech or the repair of a lacerated perineum. We have already indicated that cases of placenta prævia or eclampsia and difficult labour associated with contracted pelvis should, be dealt with in institutions.

The conduct of operative deliveries in a maternity institution is likewise an important one. In many institutions operative deliveries are conducted in the same labour room where natural confinements take place. We have realised for some time now that this is by no means satisfactory, and have come to the conclusion that every maternity institution of any dimensions should have a separate operative delivery room. We have, in our own hospital, an arrangement by which all clean cases in labour requiring operative interference are wheeled into an adjacent room which is prepared just as a surgical operation theatre is prepared, to meet the requirements of operative obstetrics. The advantages of having such a room are that everything is available to deal with emergencies that may arise in the course of an obstetric operation; that the instruments are all ready sterilised; that all the necessary sterilised dressings, pads, overalls, towels, etc., are available, and that the necessary appliances and bath for resuscitation of an asphyxiated child are also ready. This room has been utilised for all forms of operative delivery except abdominal sections; such cases are transferred to the surgical theatre in the gynæcological block and delivered there. We have utilised this obstetric operative room for the past several years and are satisfied that it should be present in every maternity hospital. The diagram shows the arrangement of the theatre equipment.

It has already been said that the technique to be observed in obstetric operations should approximate as far as possible to the technique used for any major surgical operation. Unfortunately, while this ideal should always be kept in mind, the practical limitations under which obstetric operations have sometimes to be performed necessitate the occasional adoption of a standard lower than that available for surgical operations. This is particularly so in domiciliary practice; and it is for this reason that we would once more emphasise the need for conducting all major obstetric operations in institutions, such as a maternity hospital or a maternity home, where facilities are available.

Preparations for Operation

As far as possible the patient should be delivered on an obstetric operation table or at least on a table of sufficient height.

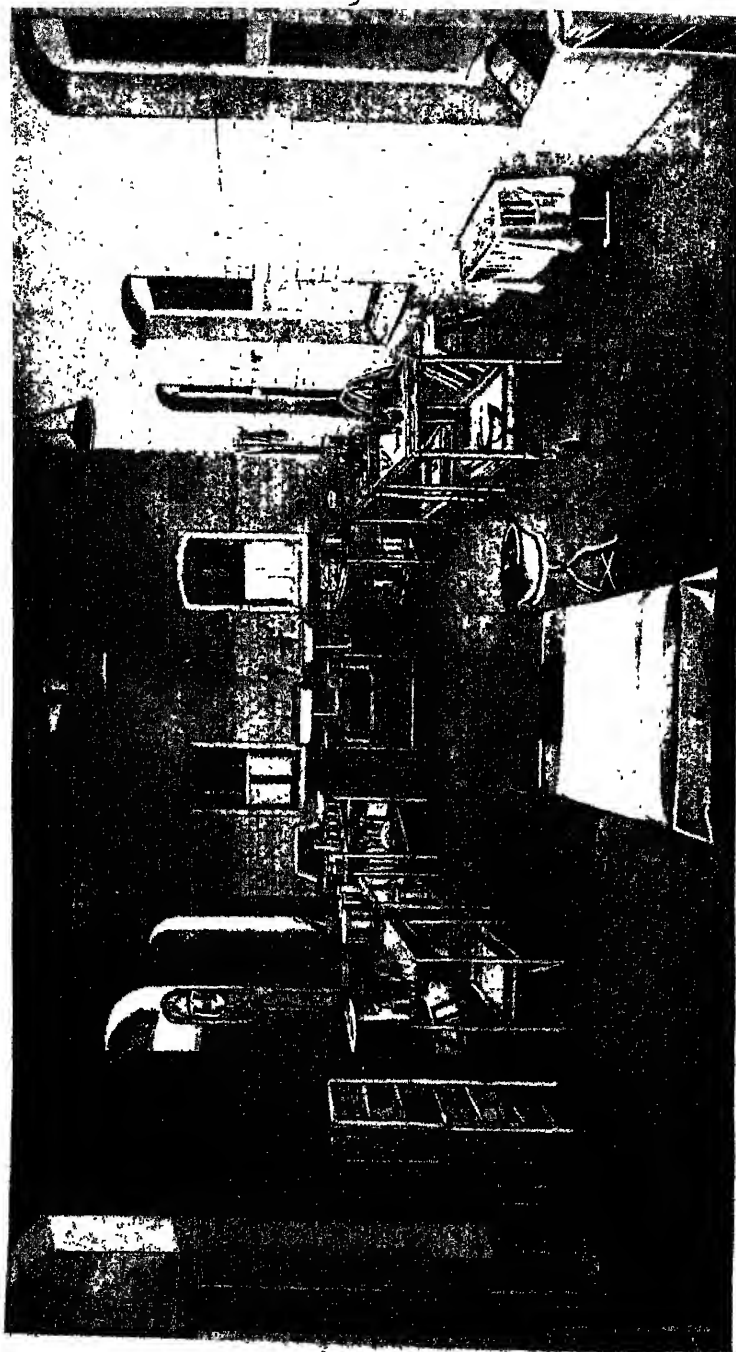


FIG. 174.—The Operative Delivery Room attached to the Labour Ward. Note the position of the Delivery Board (A) and the different accessories arranged in order.

This table should be covered by mackintoshes and clean sheets. All instruments must be properly sterilised. Metal instruments should be sterilised by boiling after preliminary cleaning with soap and water. Where an instrument is needed in an emergency it should either be dipped in a strong antiseptic, such as pure carbolic or lysol, or flamed with rectified spirits in a tray, after which it is immersed in an antiseptic solution. Trays and dishes utilised to hold the instruments should be sterilised. Rubber instruments can be satisfactorily sterilised by boiling; swabs, sponges and dressings should be sterilised by high pressure steam and kept ready for use. Sterile ligatures should always be available, such as silk, silkworm gut, catgut and linen thread. The operator and the assistants, after preliminary cleansing and disinfection of their hands, must wear sterile caps, masks, gowns and rubber gloves.

Preparation of the Patient

This is also most important and must be attended to with care. The pubic region should be washed and shaved and then painted with an antiseptic solution, thereby thoroughly cleansing the vulva and the surrounding parts. After drying the parts with a sterile towel an antiseptic should be painted over the whole region of the vulva including the upper portion of the thighs, the perineum and the surrounding areas, and the lower part of the anterior abdominal wall. Different antiseptics are used for this purpose, such as tincture of iodine, mercurochrome, violet green and dettol solution. The question of giving a vaginal douche is sometimes raised. A vaginal douche is unnecessary and occasionally even harmful, and it is not wise to adopt it as a routine measure during operative midwifery. Where the vagina is possibly infected we prefer to swab the cavity with the same antiseptic used to sterilise the skin. Whatever be the care bestowed in the preparation and toilette of the vulva and vagina it must be realised that owing to the proximity of the anus to the genital passage great care is required when making vaginal manipulations, so as to avoid possible contamination of either the fingers or instruments during the process of their introduction. The bladder should be emptied before any obstetric operation is performed. It is easy to empty the bladder by passing to male metal catheter, and this should be done as a matter of routine. A point of some importance which is often neglected is, that after the urine has been withdrawn by the catheter it is necessary to close the external opening of the catheter

by the finger before removing it, as otherwise the residual urine in the catheter dribbles into the vaginal cavity. In cases where the bladder is infected this residual urine will be a source of infection in the vagina. The rectum should have been emptied some hours before operation. If this has not been done an enema should never be given just before spontaneous or operative vaginal delivery is undertaken, as under such circumstances the greater part of the fluid is retained by the head pressing against the perineum and rectum, only to be squirted out as the pressure is released by the birth of the head. It is a great mistake, therefore, to give an enema when the head is low down.

Posture

The two common postures adopted for operative delivery are the dorsal and the left lateral positions. The former is becoming increasingly popular and, except in rare circumstances, is preferable to the latter.

Anæsthetics

It is well in all cases to give the patient an anæsthetic before operative interference. The chances of protecting the parts from infection are greater, and the manipulation made more deliberately, thereby avoiding unnecessary lacerations and the risk of sepsis. Whatever the nature of the anæsthetic chosen the degree of anæsthesia is a matter of primary importance. If very deep general anæsthesia is used the chances are that inertia of the uterus will result after delivery, so that (a) the tendency for post-partum hæmorrhage will be increased, and (b) a lax uterus will promote the formation of blood-clots and thus predispose to subsequent septic infection. For purposes of description we use the terms "obstetric anæsthesia" and "surgical anæsthesia." In the former the patient is kept just sufficiently deep so that she does not struggle about. In "surgical anæsthesia" the patient is deeply under anæsthesia, as for a major surgical operation, and occasionally this degree must be employed in operative obstetrics, for example, in the operation of version. If these principles are kept in mind the anæsthetics that are used, like chloroform, ether, gas and oxygen can all be utilised. In our experience we have had no reason to regret the use of chloroform. Chloroform may be contraindicated in those cases where there is definite evidence of hepatic damage, and in such cases other anæsthetics may be administered. The increased use of local anæsthesia in obstetrics is to be commended; deep local infiltration is far safer than spinal anæsthesia.

CHAPTER XLVI

THE FORCEPS

THE obstetric forceps is an instrument designed for the extraction of the head of the child provided certain conditions which make the operation safe are present. It is one of the most useful of instruments in the obstetrician's armamentarium, but unfortunately by its abuse it is also one of the potent causes of damage to the mother and child.

The history of the invention of the obstetric forceps and its subsequent development is interesting, and the reader is referred to the detailed account given in *The History of the Obstetric Forceps* by Sir Kedarnath Das.

The obstetric forceps consists of two blades, which cross each other and are called the left or lower blade, and the right or upper blade, according to the side of the pelvis to which they are applied.

Each blade is made up of four parts; the fenestrated blade proper, the shank, the lock, and the application handle. In some types there is in addition, traction rods and a traction handle. Each fenestrated blade possesses two curves, a cephalic curve, which enables the blade to be applied closely to the cephalic pole of the foetus, and a pelvic curve which enables it to be introduced so as to lie more or less in the axis of the parturient canal. The two blades articulate at the lock, which may be of the English type or the French type. The English type is the simpler and more efficient of the two, and allows the shank of one blade to slip into the socket of the other. In the French lock a pivot is screwed into the shank of the left blade, while in the right blade there is a notch which can be adjusted to it, the screw being tightened after locking the blades. One of the most striking advances in the evolution of the obstetric forceps is the invention of axis traction by Tarnier in 1877, and it may be said that since that date no great improvement has really been effected upon this instrument.

The common forms of axis traction forceps now in use are the improved Tarnier's, Milne Murray's axis traction forceps, and Neville's axis traction forceps. It is a matter of personal taste which particular form of axis traction forceps is used. We prefer the Milne Murray's axis traction forceps, as we find it suitable for all types of forceps delivery.

The Choice of Forceps. The obstetrician cannot be too careful in the choice of an obstetric forceps. We regret to state in this connection, unfortunately, owing to the tendency for mass production of instruments, there has been a considerable deterioration

in the standards that ought to be maintained in the manufacture of such an important instrument. We have had reason to condemn instruments supplied by manufacturers owing to defects in the shape, size, method of articulation or general make-up of the instruments, and it is unfortunate that such instruments may come into the hands of a junior practitioner, as his difficulties are considerably increased thereby. It is well, therefore, to test each instrument and make sure that it is properly finished; that it conforms to particular measurements; that it locks properly; that the axis traction rods do not slip out easily; that the traction handle can be applied without much difficulty, and that it is made entirely of metal and well annealed. To test whether the forceps satisfies the requirements it is well to note certain measurements—the maximum distance between the two blades should not exceed 7.5 cm. or 3 ins. when the forceps is articulated.

The distance between the tips should be 2.5 cm. (1 in.).

The cephalic and pelvic curves should be of proper proportion.

When the forceps is placed upon a plane the tips of the blades should be about 8.8 cm. (3½ ins.) higher than the handles.

An instrument made of stainless steel is the best; but if the model is silver-plated it must be reconditioned before further use if the plating is peeling off.

The forceps ordinarily available in the market is a little too heavy and too large to suit the requirements of the short statured Indian women. For this reason Kedarnath Das has patented a forceps—the Das Calcutta forceps—which is much lighter and smaller and is specially suitable for use in India. We have used this forceps in selected cases and have found it satisfactory.

Action of the Forceps. It is customary to state that the forceps has several actions. It may act as (1) tractor, (2) rotator, (3) compressor, (4) lever, (5) dilator and (6) stimulator of uterine contractions. But we think it is a mistake to describe some of these as actions of the forceps, for the forceps was never intended to be used for this purpose in obstetric practice. To state, for instance, that the forceps can act as a compressor of the foetal head, or as a lever, or stimulator of uterine contractions, or as a dilator, is entirely unwarranted for this reason; the forceps should never be put to such uses. The main action of the forceps is traction, a subsidiary action used in selected cases, and with due precaution is rotation.

In speaking of the forceps as a tractor it should be clearly understood that this function has definite limitations. It supplies the *vis a fronte* that is necessary in suitably selected cases to deliver the woman without damage either to the foetus or to herself. To

be under the impression that once the forceps has been applied, all that is now necessary is to apply the maximum amount of forcible traction to get the head delivered is entirely wrong, and its practice will certainly lead to disastrous consequences. It is not strength that is needed in the application of traction by the forceps, but the skilful use to the best advantage of a limited amount of force.

As a rotator the forceps must be used with care. In certain cases of occipito-posterior positions, particularly in those cases where the occiput has incompletely rotated to the front, the forceps can, if used with care, help to rotate the occiput towards the symphysis pubis. We have noticed that if light traction is applied there is a tendency for the forceps to rotate; and this tendency can be amplified, thereby helping in the forward movement of the occiput. It is not necessary that the forceps should be rotated through the whole arc of a circle, as even with light traction the head turns with the forceps and becomes an occipito-anterior.

The question of the use of the forceps as a rotator in mento-posterior cases is more debatable. But even here it is justifiable, in cases where the only alternative is craniotomy, to consider the desirability of attempting judicious rotation, so that no serious damage may occur to the maternal soft parts. When the forceps is applied to the head a limited amount of compression is inevitable, but the forceps, as already stated, should never be used for the express purpose of compressing the head and thus reducing its size so that it may pass through a somewhat contracted pelvis.

The lever action of the forceps also is not to be considered a justifiable function, as there is grave danger of lacerating the soft parts. In former years an instrument known as the Vectis, which roughly resembled one blade of the forceps, was used as a lever, particularly in certain varieties of occipito-posterior position. The instrument is no longer included in the obstetrician's bag.

With the improved facilities now available for stimulating uterine contractions, it is out of question to think of utilising the forceps for this purpose. Lastly, the forceps should never be used for dilatation of the birth canal, as serious lacerations are bound to result. In fact, it will be stressed later that one of the essential conditions for safe application of forceps is full dilatation of the cervical canal, and if this is not present, other methods of dilating the genital passages must be resorted to before application of forceps. We may therefore repeat that the functions of the forceps should be restricted to traction and rotation.

Indications. Strictly speaking, there are only two indications for the application of forceps. (1) Indications on behalf of the

fœtus, (2) Indications on behalf of the mother. Any sign of distress on the part of the fœtus or the mother is an indication for application of Forceps; Any sign or symptom suggestive of the possibility of such distress arising, if the case be left alone, should be considered an equally important indication for immediate delivery, which in suitable cases may be by the application of forceps.

The signs and symptoms of fœtal distress are:—

(1) Variations in the fœtal heart-rate, as indicated by a marked slowing or undue rapidity. If the fœtal heart becomes irregular or is below 120 per minute, or if it rises above 160, between pains, the fœtus should be considered to be in distress.

(2) Escape of meconium unmixed with liquor amnii in a presentation other than a breech. The escape of meconium in a breech presentation may be of no consequence, as during the passage of the breech through the pelvic cavity the mechanical pressure of the pelvis forces out a certain amount of meconium.

(3) Tumultuous movements of the fœtus within the uterus. These are generally indicative of asphyxia and can be likened to the convulsive movements of the second stage of asphyxia in the adult.

(4) Prolapse of the pulsating cord is a sign of grave danger to the child, as it is likely to be compressed by the presenting part and the fœtal circulation thus arrested.

(5) A large caput succedaneum or extreme degree of moulding in a vertex presentation.

We lay great emphasis on the last of these indications, because we are convinced that even in the presence of a fœtal heart of moderate intensity and a rate within physiological limits, the presence of a large caput or marked moulding is indicative of impending distress. Either of these mean prolonged and continued pressure on the fœtal skull and its contents, and eventually the most delicate areas, the floor of the fourth ventricle, where the vital centres are situated, become involved. Experience has shown that the respiratory centre is more easily paralysed and at an earlier stage than the circulatory centre. After delivery it is not uncommon to notice that while the umbilical cord goes on pulsating for a fairly long time the child makes no attempts at respiration.

Signs of Maternal Distress. In a large number of cases the signs of maternal and fœtal distress occur simultaneously; but sometimes signs of maternal distress may alone warrant interference, even though there are no signs of fœtal distress.

Certain diseases of the mother justify the use of forceps because they predispose to the early development of maternal distress.

Examples of such are valvular disease of the heart, with or without decompensation, toxæmias of pregnancy, antepartum hæmorrhage, pulmonary diseases like pneumonia, advanced tuberculosis, pulmonary œdema, etc., and exhausting illnesses which make it desirable that the second stage of labour should be shortened as far as possible.

In a few cases, even though there may be no absolute indication of distress either of the mother or the foetus, it may be necessary to apply forceps and terminate labour to avoid the onset of distress. If the second stage of labour has lasted for some time and there is no advance, and if the conditions for the safe application of forceps are fulfilled, there is no object in allowing the head to remain indefinitely in the pelvic cavity, compressing the maternal soft parts and thus increasing their liability to infection and sloughing. The head itself is subject to compression under such circumstances, increasing the risk to the child during delivery and in the neonatal period. It is not uncommon to find that in such cases, asphyxia pallida or a still birth resulting; in some cases cerebral complications like convulsions or hyperpyrexia may occur during the neonatal period.

If exhaustion of the mother from such a prolonged labour has developed it forms another indication for interference.

Causes which may necessitate the eventual Application of Forceps. Among this group may be mentioned:—

- (1) Faults in the passages.
- (2) Faults in the passenger.
- (3) Faults in the uterine forces.

Some obstetricians group these under indications for forceps application. But we feel that whatever these faults may be, unless indications suggestive of distress to the mother or the foetus develop, or are likely to develop the question of the application of forceps does not arise. The factors which may finally bring about signs of foetal or maternal distress, and thus necessitate the application of forceps, may be connected with the passage, passenger or powers.

(1) *Faults in the Passages.* These faults may be either in the bony canal or in the soft parts. Minor degrees of disproportion by prolonging the first and second stages of labour may result in the appearance of foetal distress and so forceps may have to be applied to effect delivery as quickly as possible. We have already stated that the forceps should not be used as a compressor. Its place therefore in the management of labour in contracted pelvis

is strictly limited to traction of the head after it has moulded and the greatest diameter has passed through the brim of the pelvis.

So far as the soft parts are concerned, obstruction by them should never be overcome by forceps except at the vaginal outlet. Where the head is delayed in its progress, especially by rigidity of the perineum and the forces are feeble, forceps with episiotomy is justified. This condition is more likely to be met with in muscular women or elderly primiparæ.

(2) *Faults in the Passenger.* This may be due to malpresentations or malpositions, or to certain defects of the head. Thus, in occipito-posterior positions, in brow, face, and generally in cephalic presentations with moderate degrees of deflexion, the forceps may be necessitated.

A postmature head, an unduly ossified head, may likewise cause delay and necessitate forceps because of the limited degree of head moulding possible.

In cases of occipito-posterior positions the occiput may have undergone reversed rotation or remained unrotated, or rotate imperfectly anteriorly through an angle of 45 degrees or less; in such cases it is necessary to use the forceps not only as a tractor but as a rotator as well.

Loops of cord round the neck, or an unduly short cord, may sometimes impede the progress of the head and necessitate the application of forceps.

Difficulty in the delivery of the after-coming head in breech presentation may occasionally necessitate forceps.

(3) *Faults in the Uterine Forces.* For a vaginal delivery to terminate successfully the uterine contractions must generally be sufficient to force the head through the pelvic canal. The uterine contractions, however, may be weak or inefficient, and sometimes they may be completely absent. In this last condition the application of forceps is contraindicated; and even when they are weak or ineffective it is desirable if possible to stimulate the uterine contractions before considering the termination of labour by forceps.

Forceps has commonly to be applied when the head comes to what is known as the "sticking point." The curved path which the head has to take during its passage through the pelvic canal presents most difficulty low down in the pelvis, for the head has to emerge in a direction practically at right angles to that in which it engaged and passed through in the brim of the pelvis. If the force of uterine contractions is not sufficient to push the head past this sticking point it may remain in that position and the uterus becomes exhausted, the contractions become gradually weaker and

weaker and the head may lie pressing on the perineum for a considerable time, unless help with forceps is available.

Conditions to be satisfied before the Application of Forceps. The obstetric forceps should never be used unless certain definite conditions are present which make their application safe. These are :—

- (1) The cervix must be fully dilated and taken up.
- (2) The uterus must be contracting.
- (3) The membranes must be ruptured.
- (4) The presentation should be a cephalic presentation.
- (5) The head must not be too large or too small.
- (6) The greatest diameter of the head should have passed through the brim of the pelvis, and there must be no disproportion between the foetal head and the pelvis anywhere in the cavity or outlet.
- (7) The bladder and rectum must be empty.

The head should be in a suitable attitude and correspondingly suitable position, i.e., fully flexed with the occiput-anterior or fully extended with the chin anterior. Preliminary manual manipulation may be necessary to establish these conditions, for example, manual rotation of a persistent occipito-posterior position of the vertex.

Full Dilatation of the Cervix. One of the most important points to be emphasised is that the cervix must be fully dilated and taken up before forceps is applied. Sometimes where immediate delivery is indicated and the cervix is not fully dilated, forceps may be used, provided the dilation is first completed manually. The necessity for this rule is that serious tears of the cervix are bound to occur and the lacerations may extend up into the lower uterine segment, if the forceps is applied before dilation is complete. The dangers of such extensive lacerations are obvious, as the uterine vessels may be involved or the peritoneal cavity opened, and besides the immediate shock and severe hæmorrhage which result, sepsis and sloughing of the parts are almost certain to develop later.

The Membranes must be Ruptured. This is a condition easily fulfilled; and indeed in the large majority of cases there is no necessity to consider a forceps application before rupture of the membranes has taken place. Very rarely does the child become distressed while the membranes are still intact, and when signs of foetal distress do manifest themselves with intact membranes it is desirable to rupture the membranes and watch the case for some time before preparing for a forceps delivery.

Should the forceps be applied with the membranes intact the chances are that the instrument will slip owing to the smooth surface of the membranes, and if traction is still applied premature separation of the placenta with serious bleeding may ensue.

The foetus should be presenting either as a vertex or as a face; and it is necessary before the forceps is applied that the position should be accurately diagnosed. The forceps should never be applied either to a breech or a shoulder presentation, nor should forceps be used in a brow presentation unless it has been first changed into a vertex or a face. The forceps can be successfully applied to the after-coming head in a breech presentation, and this method is becoming very much popular now.

The Head must not be too Small. This condition should be borne in mind for two reasons. With a small head the forceps would tend to slip; secondly, there are greater chances of damage to the brain by the application of an instrument like the forceps to a small premature infant. It is therefore better to avoid this mode of delivery in such cases should interference be called for.

The Uterus must be Contracting. This is an important condition. The delivery of a child when the uterus is in a state of inertia favours the occurrence of severe atonic postpartum hæmorrhage, and the obstetrician should never undertake forceps application till the uterus has first been stimulated to contract.

The forceps should generally be applied only after the greatest diameter of the head has actually passed through the brim. Further, there should be no disproportion between the head and the pelvic cavity and outlet. If the head has not passed through the brim after or before moulding, the application of forceps is not the suitable method of delivery.

It is important to realise that occasionally head moulding of an extreme degree or a large caput may give the impression that the head is low down, whereas on making a more detailed vaginal or bimanual examination it is found that the greatest diameter is still above the brim.

The Bladder and Rectum must be Empty. This is an essential condition because a distended bladder causes the anterior vaginal wall to sag and favours the occurrence of trauma which may result later in the formation of a cystocele or even a fistula. Further, a distended bladder offers some obstruction to the easy delivery of the head. The risk of faecal contamination of the operative field is reduced if the rectum is empty.

Method of Application. The technique of the application of forceps must be thoroughly understood by the obstetrician. Failure

to extract the head, damage to the foetal head, lacerations of the maternal soft parts and the increased incidence of morbidity in the puerperium are in the majority of cases due to faulty technique. The patient should be prepared for the operation, every care being taken to see that the parts are shaved, cleaned and rendered aseptic. The instruments and the hands of the operator must be sterilised. It is preferable to have the bowels emptied; but should this not have been done at an earlier stage of labour it is not desirable to give an enema immediately before the operation. The bladder should always be emptied by the passage of a rubber catheter, or if this is not successful by introducing a male metal catheter. A glass catheter should never be employed to empty the bladder during the first or second stages of labour. Occasionally, when the head is jammed in the pelvic cavity or low down, much difficulty may be experienced in the passage of a catheter. If the presenting part is gently pushed up a little a catheter will usually pass. If this is not successful a male metal catheter is used and, guided carefully by the finger, passed into the vagina along the line of the urethra. It will generally slip into the bladder fairly easily. No force should be used in passing a catheter; and if sometimes there is considerable difficulty and the urethra begins to bleed, it is wiser to desist from any further attempts and proceed with the delivery.

The patient should be under a general anaesthetic and is then brought to the edge of the bed and made to lie in the dorsal posture, with the legs supported mechanically or by assistants. Some prefer the patient to be in the left lateral position. The operative field is then covered with sterile towels or sheets and the forceps applied. Whether to apply the ordinary long forceps or an axis traction forceps depends upon the position of the head with reference to the pelvic cavity. In the majority of cases the axis traction forceps is preferable.

There are two ways of applying forceps:—

- (1) The cephalic method, and
- (2) The pelvic method.

In the *cephalic method* the blades are so applied that they are in accurate apposition with the sides of the head with an ear in the centre of each fenestra. This causes compression in the biparietal diameter where it does the least harm, also with a cephalic grip the blades fit much better and do not tend to slip. To do this successfully requires a careful appreciation of the position of the foetal head with reference to the pelvis and the

accurate adaptation of the blades to the sides of the foetal head, irrespective of its position in relation to the maternal pelvis.

In the *pelvic method* the blades are applied with reference to the maternal pelvis, one being placed on the right side and the other on the left side. If the head has not rotated so as to bring the occiput underneath the symphysis pubis, the grip of the forceps



FIG. 175.—Forceps application. Method of holding the left or lower blade before application.

on the foetal head may cause some damage to it. Occasionally it has led to injuries to the eyeball or some soft part of the foetal head. Further, this method is more prone to cause intracranial hæmorrhage as pressure is applied to the foetal head in a much less favourable diameter.

When the head has rotated completely into the antero-posterior diameter of the pelvis, the pelvic method gives the same grip as the cephalic and is technically easier of application and satisfactory. This is the method of application in the great majority of cases.

Introduction of the Blades. With the patient anaesthetised and the parts carefully prepared the operator sits on a stool of convenient height, and after having emptied the bladder by passing a catheter, takes the left or lower blade in his right hand. He introduces two fingers of his gloved left hand into the vaginal cavity on the right and posterior quadrant of the pelvis, so that the palmar surface of the fingers are looking upwards and to the left. The lower blade is lightly held with the axis traction rod in intimate contact with the handle in the right hand, as one would hold a spoon. The tip of the blade is held at right angles to the palmar surface of the fingers in the vagina and gently slipped along the fingers into the vaginal cavity, first as a posterior blade, and then when the whole of the cephalic portion of the blade has been introduced it is gently rotated laterally to make it the left blade. The two fingers passed into the vagina are to direct the blade of the forceps along the vagina and to see that the blades are introduced within the cervical canal in close apposition to the head. It is not necessary to introduce the half hand into the vagina for slipping in the blades of the forceps. We hold further

that the introduction of the half hand very often pushes the presenting part upwards and thus converts a low forceps into a mid-forceps and a mid-forceps into a high forceps. That the

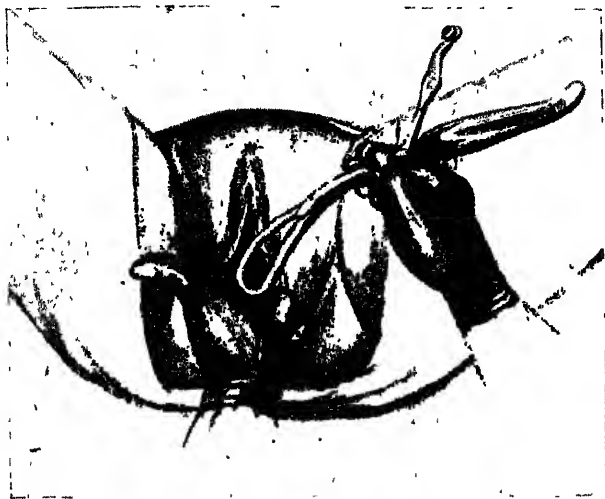


FIG. 176.—Forceps application. Method of introduction of the left blade.
Note the two fingers in the vagina.

lower blade has been correctly applied can be verified by pressing the handle well against the perineum, when if the handle is seen perfectly straight without any slight tilting to one side or other, it can be presumed to have been properly applied. Should the lower blade have been applied properly it will rest there and not tend to slip out. An assistant may, if necessary, lightly steady the handle in this position. The operator then removes his left hand, immerses it in lotion and introduces the same two fingers, but this time above and to the right, nearer the symphysis pubis, so that the palmar aspect of the two fingers is facing downwards and towards the left. The right blade is taken in the right hand, the handle being gripped, and the axis traction rod made to rest lightly on the knuckle of the mid-finger. The blade is now held parallel to the mother's abdomen, the tip being pressed against the palmar aspect of the two fingers, and by gently rotating through half a circle the cephalic portion is gradually inserted into the vagina to lie in close apposition with the head. As the blade passes through half the circle it will be generally found that it slips into the right side and adapts itself to the cephalic pole.

Locking of Forceps. As soon as the blades have been introduced the forceps should be locked. Considerable difficulty is

occasionally experienced in locking the blades; but if it is kept in mind that the proper thing to do is to bring the right blade to meet the left blade and never to alter the position of the left blade locking of the blades will be found easier. Another point to

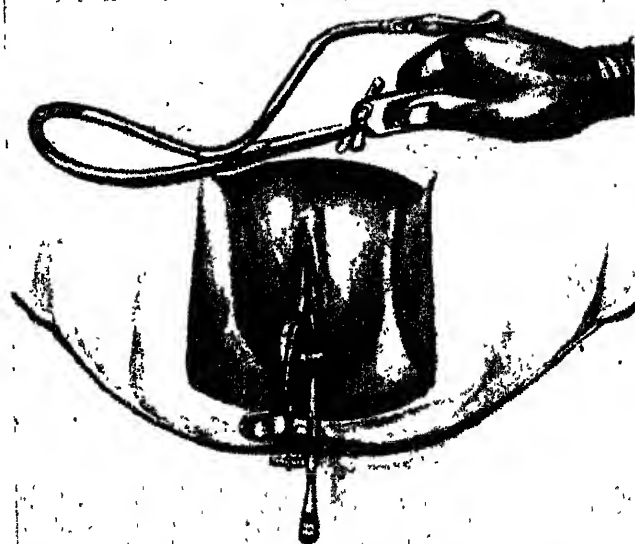


FIG. 177.—Forceps application. Method of holding the right or upper blade: the left blade is in situ.

remember is that both handles should be pressed well posteriorly against the perineum and again locking will be easy. Occasionally it will be found in occipito-posterior positions that even after locking of the blades the handles do not come exactly in apposition with each other throughout the whole length.

After locking the blades and before the fixation screw is applied, the axis traction rod of the right blade should be carried posteriorly past the left handle and pressed towards the perineum to meet the axis traction rod of the left blade. The screw is then tightened, the axis traction rods locked, and finally the traction handle applied. The forceps is now applied and it is desirable at this stage to make a careful vaginal examination to ascertain that the blades have been properly introduced and fitted against the cephalic pole, and that no part of the cervix has by accident been caught within the blades of the forceps. Having satisfied himself about this the obstetrician can now proceed with traction.

Traction. Traction should be applied through the traction handle, keeping the traction rod parallel to the shank. The force employed should never be greater than what the flexed forceps

can exert. Generally it is advisable to pull during a pain, and between pains the traction screw, which is only lightly fixed, is unlocked for a short interval to relieve compression of the head



Fig. 178.—Forceps application. Method of introduction of the right or upper blade.

Note the position of the axis traction rod of the upper blade resting on the knuckle of the mid-finger.

within the blades of the forceps. Usually two or three pulls will bring the head on to the perineum, and from this point very little force is required to complete the delivery. When the occiput has emerged from under the symphysis it is desirable to remove the blades and to complete the delivery in the manner described in the chapter on the management of normal labour.

In removing the blades care must be taken to see that this follows the law of curves, the right one being carried towards the left side and the left one towards the right side. Some obstetricians prefer to complete the delivery with the forceps *in situ*, as they hold that a greater control over the advance of the head can be thus obtained. There is little to choose between the two methods of delivery, but it is our experience that the perineum can be better controlled and saved if the forceps is removed just

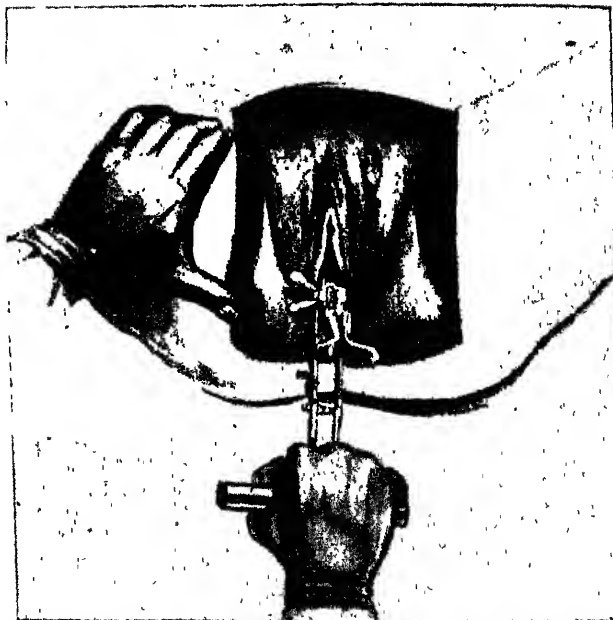


FIG. 179.—Forceps application. Method of traction after locking of the forceps.

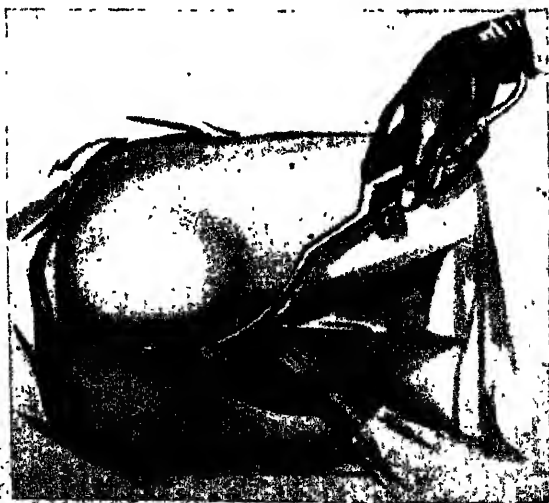


FIG. 180.—Forceps application in the left lateral position. Introduction of the lower blade.

before the greatest diameter of the head passes through the vulvar outlet.

After delivery of the head the shoulders are delivered and the rest of the body slips out.

In every case where forceps is applied all the necessary accessories for the treatment of asphyxia neonatorum should be ready for immediate use.

The management of the third stage of labour and any necessary repairs of the perineum, etc., are dealt with in another chapter.



FIG. 181.—Forceps application in the left lateral position. Introduction of the upper blade.

Varieties of Forceps Application

It is customary to refer to the varieties of forceps operation depending upon the level of the head in relation to the pelvic cavity. Four varieties are described:—

- (1) Floating forceps—when the head is above the brim of the pelvis and not engaged.
- (2) High forceps—when the head is engaged but the greatest diameter has not passed through the brim.
- (3) Mid-forceps—when the greatest diameter has passed through the pelvic brim and the head is in the mid-cavity.
- (4) Low forceps—when greatest diameter of the head has passed the pelvic cavity and is now pressing on the perineum.

Floating forceps is an operation that is never employed now. When the head is not engaged in the brim of the pelvis the forceps should never be used. There are no exceptions to the rule. Other

methods of delivery should be seriously considered and adopted in such cases viz ; internal podalic version or lower segment Cæsarean section.

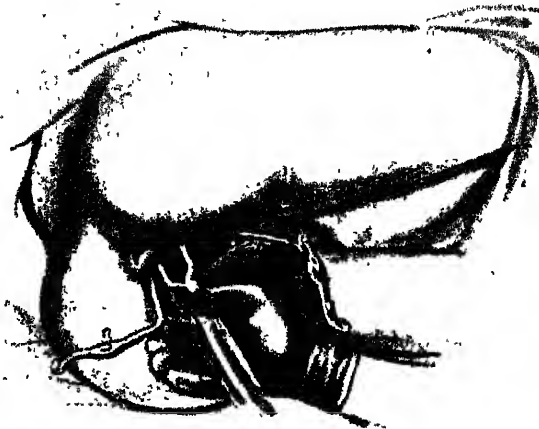


FIG. 182.—Forceps application in the left lateral position.

Note the position of the axis traction rods after locking the blades of the forceps.

The high forceps operation should be very rarely necessary, and with increasing experience the obstetrician will find that the occasions when he has of necessity to apply the high forceps are



FIG. 183.—Axis traction forceps *in situ*.

very few indeed. The dangers of high forceps are twofold. The increased pressure exerted upon the foetal head increases the risk of serious intracranial injury, and it is now well realised that many cases of deep asphyxia are due to these causes.

to the maternal parts are also inevitable with the application of high forceps, and for these reasons we would suggest that other methods of delivery should be seriously considered before resorting to the application of high forceps.

The mid-forceps and the low forceps are the two operations commonly and justifiably employed.

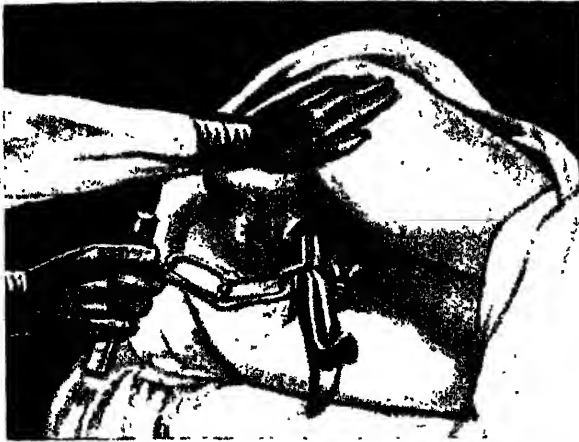


FIG. 184.—Forceps application. Traction with forceps.

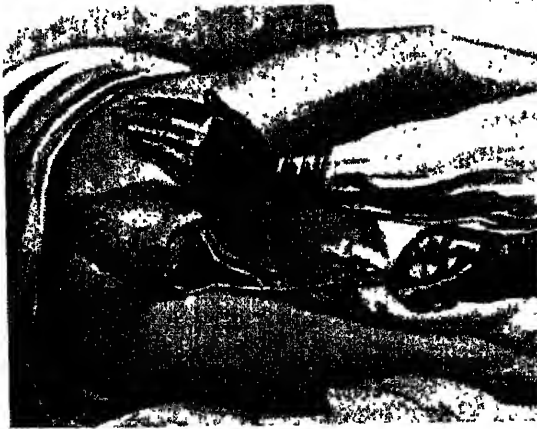


FIG. 185.—Forceps application. Delivery of the head at the outlet.

Slipping of the Forceps

The forceps may slip when traction is applied. The conditions under which this accident occurs are:—

- (1) Faulty application. When the forceps is applied too low on the head, so that it never grasps the head properly, the blades may slip.

(2) In certain cases of occipito-posterior position the forceps does not get a good grip of the foetal head if a pelvic application is used, and there is always a tendency to slip unless care be taken to favour rotation of the head before traction is applied.

(3) When applied to a hydrocephalic head, forceps generally tends to slip. It is obvious that in severe degrees of hydrocephalus the head is too big for the forceps to be applied properly, and a grip over a small portion of the cephalic pole only is obtained.

(4) Occasionally, in cases of rupture of the uterus, forceps may tend to slip as the head recedes.

(5) When applied to a small head or a macerated foetus the forceps tends to slip.

(6) Too powerful a traction or too sudden traction by a jerky movement favours slipping of the forceps.

The slipping of the forceps is an unfortunate and dangerous accident. The sudden stretching of the vaginal walls causes severe laceration of the vagina and perineum with hæmorrhage and a certain amount of shock. The presenting part also tends to recede higher up. When there is any tendency for the forceps to slip, traction must at once be discontinued and a careful examination of the presenting part and of the pelvis made to determine as far as possible the particular causes responsible. In some cases it may be found that the method of delivery by forceps is unwarranted or unsuitable; in such cases other methods of delivery must be considered.

Forceps may fail to produce any effect on the progress of the head. A careful examination in such cases has sometimes revealed the fact that the head is still high above the brim and is not really engaged and that a large caput in the vagina has obscured the true level of the head. Under such circumstances and especially in multiparæ with no evidence of disproportion, we have frequently performed internal podalic version and extraction, provided, of course, that the conditions were safe for such an operative method of delivery. The results have been gratifying to both the mother and the child. This may seem an obstetric heterodoxy, but practical experience has made us realise the value of version in some of these cases where an unfortunate error of judgment has selected the application of forceps as the method of delivery. It is true that a more thorough examination and a better appreciation of the position of the head with reference to the brim of the pelvis would have prevented the use of forceps and might have suggested the performance of version as a safe method of delivery. But when such difficulties arise we have had little hesitation in performing version, provided the necessary

conditions are present. We are interested to find that such an authority as DeLee has taken up the same position, and we make no apology for quoting him on the subject: "Curiously, and in contravention to all classic obstetric rules of conduct, in such cases one may sometimes perform podalic version and extraction even after the head is engaged, and after attempts at forceps have failed. Version and forceps application are not complimentary operations; rather, where version is indicated, forceps is contraindicated. Yet occasionally a case will occur when the circumstances detailed above exist, or a mistake in judgment has been made, or the cord prolapsed, and one may depart from accepted dogma and secure a happy result by an unorthodox procedure." We have nothing to add to this excellent statement of the case.

Pajot's Manœuvre

Occasionally when the head is fairly low down the ordinary long forceps (Simpson-Barnes') may be applied. The forceps is applied in a manner similar to that described for the axis traction

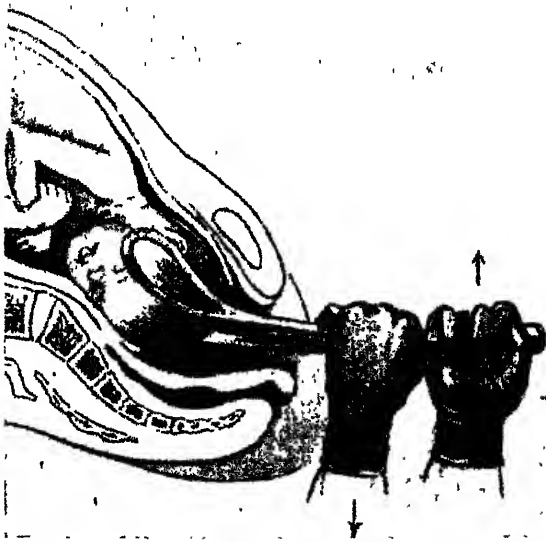


FIG. 186.—Forceps application: Pajot's manœuvre.

forceps, except, of course, that there are no axis traction rods to be dealt with. If after application of the forceps there is any difficulty experienced in traction, a manœuvre suggested by Pajot can be adopted. The handles are gripped by both hands, the left hand gripping it with the palm directed downwards, while the

right hand grips in the opposite direction; pressure is exerted downwards and backwards by the left hand while the right hand applies traction, thereby the head is made to follow the curve of Carus and so delivery is effected.

Forceps in Occipito-Posterior Positions of the Vertex

This subject has been referred to already in the chapter on occipito-posterior position of the vertex. It is generally advisable to rotate the occiput anteriorly before the application of forceps is made. This manœuvre can be done by introducing the half hand and so rotating the occiput forwards. The occiput is then steadied and the forceps applied and delivery completed. Sometimes, however, this manœuvre does not succeed, for example, in a case seen late in labour when the head has become jammed in the pelvis and a large caput has developed. The question then is how to effect delivery with forceps. It has been already stated that in a large number of cases where the occiput has rotated slightly, or even where it has failed to rotate, light traction by the forceps initiates rotation which may then be completed by the forceps. The method of application of forceps in these cases is of some importance; in an occipito-posterior position the cephalic method is preferable, as the chances of the instrument slipping are much less. Whether the pelvic method or the cephalic method is adopted, in cases where rotation has not been completed spontaneously and the forceps is used to rotate, the forceps comes to lie anteroposteriorly or nearly so, with reference to the maternal pelvis or even back to front. It is necessary under these circumstances before delivery is completed to remove the blades and reapply them, so that the pelvic curve of the forceps will again fit the curve of Carus.

An alternative manœuvre which is sometimes adopted, but which we do not favour, is to apply the blades in the reverse direction, so that the pelvic curve is directed posteriorly, and then to rotate. The forceps after complete rotation will be in the natural position with the concavity of the pelvic curve directed anteriorly. We believe that the best method of rotation is to take advantage of the natural tendency for the forceps to rotate after application and so we cannot recommend this method of application.

In some cases if traction is applied without carefully noting the tendency for rotation the head may slip out suddenly and be born as a persistent occipito-posterior, with the face towards the pubis. If this happens there is a greater tendency for severe

lacerations of the perineum to occur and the foetal head also is more susceptible to damage.

Forceps in Face Presentations

Where the chin is anterior spontaneous delivery is likely to occur provided there is no disproportion. Occasionally, however, for the same reasons which delay an occipito-anterior position, a mento-anterior case may require help with forceps. Some care and defecacy in manipulation are necessary in the introduction of the blades, as the soft parts of the foetal face are liable to be damaged. The place of forceps in mento-posterior cases has been debated at length. Every effort should be made to favour anterior rotation of the chin before application of the forceps, but cases have occurred in one's experience where this has failed to take place. Under such circumstances forceps may be applied and with light traction a tendency to rotation may be noted. This must be encouraged so as to bring the chin anteriorly. The forceps must then be removed and reapplied before delivery is completed, just as in forceps rotation of occipito-posterior positions of the vertex. The alternative, craniotomy, which is the last resort, should not be undertaken till the forward rotation of the chin has been tried. Rotation in mento-posterior cases does mean a greater risk of injury to the soft parts of the face, but such injuries are not serious and generally do not lead to any permanent damage.

Forceps in Brow Presentations

Forceps should not be used in a brow presentation until the brow has been converted into a face or a vertex presentation. In many cases it is wiser to convert the brow into a breech by internal version wherever this is possible. In some cases, however, it may be found impossible to convert the brow into a more favourable presentation and then the question arises whether the forceps should ever be used. As the forceps is generally applied before perforation we apply forceps and attempt traction, giving two or three fair pulls. It is surprising how, where the head is not too big, even when it presents as a brow, it may be delivered. If this does not succeed, at this late stage of labour perforation may be done and delivery completed by extraction with forceps.

Forceps to the After-coming Head

In considering the management of cases of breech presentation we have referred to the use of forceps for delivery of the after-

coming head. The forceps may be applied to the after-coming head in one of two ways:—

(1) The body of the child may be carried upwards towards the mother's abdomen and the blades of the forceps introduced, below the trunk. The operator then applies traction on the forceps.

(2) Occasionally the forceps may have to be applied in front of the trunk, in those cases where the occiput is posterior.

In all cases where forceps is applied to the after-coming head, great care is required in its application and the subsequent extraction of the head, as otherwise considerable damage to maternal tissues may ensue. It is not very often that one is called upon to apply forceps to the after-coming head, as the manœuvres described under breech presentations for the delivery of the after-coming head will, with experience, seldom fail.

Forceps to the Decapitated Head

In some cases forceps may have to be applied to deliver the decapitated head. Usually the decapitated head can be easily delivered by fundal pressure, and a finger introduced into the mouth in a manner similar to delivery of the after-coming head of a breech presentation. When this fails it is advisable to grasp the head with a volsellum, steady it by fundal pressure and apply forceps. If the head cannot be delivered with easy traction there should be no hesitation in perforating the vault of the skull and then delivering the head. If there is still difficulty, a cranioclast must be applied.

Prognosis in Forceps Application

Any interference with nature in the delivery of the child, such as a forceps application, must necessarily add to the risks of the mother and foetus. The outlook also varies according to the indications; with all the conditions for the safe application of forceps satisfied these risks will be reduced to a minimum; but if the forceps is used at a stage when it is not safe, or under circumstances when its use is contraindicated, the gravest risks may be incurred both by the mother and the child. As a rule, the higher the head in the pelvis the greater is the risk for both mother and foetus. The outlook also varies according to the indication for which the forceps is applied. For example, it is greater when used in cases of occipito-posterior position or contracted pelvis than for delay due to a rigid perineum.

The slipping of the forceps is a serious accident.

The risks to the mother in the application of the forceps
are:—

(1) Injury to the soft parts, such as tears of the vagina, cervix and even lower uterine segment; lacerations of the urethra and perineum with possible involvement of the rectum. Fistulous communication with the bladder or the rectum may result.

(2) Hæmorrhage. This may be the result of lacerations. Occasionally if the forceps is used where the uterus is not contracting and has not regained its tonus, delivery may be followed by severe atonic postpartum hæmorrhage.

(3) Infection. This is one of the gravest dangers and the chances of infection are increased not merely by the introduction of the forceps in a careless manner, but by the lacerations and the hæmorrhage which render the mother more susceptible.

These are the immediate risks, but it must be realised that there are remote effects which must be taken into consideration when assessing the prognosis for the mother. The remote risks are due to the lacerations of the vagina and perineum which produce a relaxation of the pelvic floor and favour the development of cystocele, rectocele and uterine prolapse. Occasionally there may be no tear of the skin surface, but the separation and divarication particularly of the levatores ani may lead to a weakening of the pelvic floor. Tears of the cervix and the lower uterine segment may lead to chronic cervicitis, atresia, or chronic pelvic inflammatory trouble. Erosions of the cervix at a later date predispose to malignant changes. Infections of the urinary tract may persist and lead to diverse complications at a later stage.

A complication that may occasionally be noted is subluxation of the symphysis pubis, which weakens the pelvic girdle. In fact, more damage is done to the mother after the forceps application than after any other form of delivery, and the large number of women who seek assistance some months or even years after such a delivery at the gynæcological out-patient department, demonstrates the amount of damage that may result to the mother from injudicious use of the instrument.

Dangers to the Child. These may be compression of the brain, intracranial hæmorrhage, tears of the tentorium, fracture of the skull, injury to the eyeball even leading to avulsion of the eye, retinal hæmorrhages, corneal opacities, facial paralysis, pericranial hæmatoma, lacerations of the scalp and Erb's paralysis.

It should not, however, be thought that these various injuries to the mother or the child occur frequently or are inevitable. The emphasis is to be laid rather on the proper use of the instrument and the prevention of its abuse.

Kielland's Forceps

In 1915, Kielland of Norway introduced a new forceps which has been widely used in Germany and Scandinavia. The advantages claimed for this forceps are:—

- (1) The head is always grasped in the biparietal diameter and hence in the subsequent traction there will be no slipping of the forceps. The application is always cephalic.
- (2) Forceps rotation of the head is safe as the blades fit the head closely and there is no possibility of slipping.
- (3) Such pressure as is inevitable in the application of this forceps is made on that part of the foetal head which can best resist it, so that the cheeks, the underlying bones, the orbits, chin, etc., are not affected, and the inevitable trauma to the soft parts, to nerves and brain does not therefore result.
- (4) Another advantage claimed is that the presenting part is not displaced by the introduction of the blades, and that as less forcible traction is necessary for the delivery, the risk of maternal injuries is minimised.

The forceps itself consists of two blades which are articulated by a slot on one of the blades into which the other blade slides.

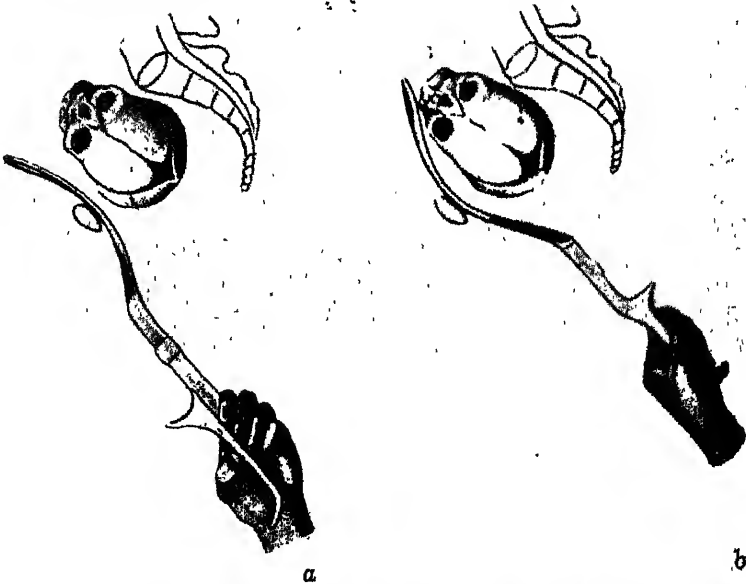


FIG. 187.—Kielland's forceps: showing (a) the introduction of the anterior blade; (b) position of the blade after rotation.

The absence of any locking arrangement, as in the ordinary forceps, is significant and the method of articulation is the most characteristic.

teristic feature of this instrument, allowing one blade to slide longitudinally along the other. The advantage of this is that the head may be grasped by the blades lying at different vertical levels. There is a very small pelvic curve so that the blades resemble the old model of straight forceps. The cephalic curve is almost similar to that in the ordinary Simpson-Barnes' forceps.

The method of application of Kielland's forceps is as follows:—

The patient is placed preferably in the dorsal position, with the buttocks well over the edge of the table; and after the usual antiseptic precautions have been taken and the parts protected with sterile sheets, the bladder is emptied by passage of a sterile catheter and the patient anaesthetised. The position of the head is well defined.

The anterior blade is now taken in the right hand and two fingers of the left hand inserted into the vagina, so as to pass beyond the anterior lip of the cervix and underneath the symphysis pubis. The blade is introduced horizontally, the fingers guiding it into position with the concavity of the foetal curve facing the pubis.

The blade is passed well into the vagina until the tip of the blade touches the skull and then onwards well inside the uterus, but with no force, until the middle round part of the shank lies under or behind the symphysis pubis. The vaginal fingers are now withdrawn and the anterior blade is rotated on its long axis.

The rotation is done through 180° towards the side on which the button is situated on the forceps blade. The anterior blade is thus applied automatically with its tip over the malar bone of the foetal head. The blade is left *in situ* without any artificial support.

The second or posterior blade is now guided by two fingers passed into the vagina between the posterior cervical lip and the head. The blade is gently passed to the side of or in front of the sacral promontory. The blades are now locked, and as the lock is so constructed that it will be effective even if one blade is higher than the other, little difficulty will be found in this procedure. The forceps is now in the antero-posterior diameter of the pelvis and has grasped the head symmetrically. Traction is applied intermittently in the direction of the handles of the forceps until the head reaches the middle of the pelvis or lower down.

When the head has been brought well down into the pelvic cavity it can be rotated by the forceps, so that the occiput comes to the front. In some cases the rotation is spontaneous, and as the outlet is approached extraction through the outlet should be slow to avoid tears of the perineum.

The *contraindications* for the use of Kielland's forceps are stated to be :—

- (1) When the head is floating above the brim.
- (2) In cases of contracted pelvis where the head is still above the inlet.
- (3) A large head causing gross disproportion or a hydrocephalic head.
- (4) When the uterus is tonically contracted and a retraction ring is present.

Although the use of Kielland's forceps has been very strongly advocated by some obstetricians, we have been unable to appreciate the many advantages claimed for this instrument. In our opinion it is not in any degree safer than the ordinary axis traction forceps; and if one is accustomed to apply axis traction forceps or the ordinary Simpson-Barnes' forceps properly, many of the so-called disadvantages which are supposed to be overcome by Kielland's forceps will not arise. Slipping of the forceps is generally due to an incorrect appreciation of the position of the head and the necessity to favour rotation before using traction. Neither the Kielland's forceps nor the ordinary Simpson-Barnes' forceps should be used when the head is still above the brim of the pelvis. With care in the method of application and traction properly controlled there should be little or no tendency for any damage to the foetal head or to the maternal parts. The ordinary Simpson-Barnes' or axis traction forceps can be applied with reference to the foetal head in the same manner in which the Kielland's forceps is supposed to grasp it. We fail to see why the head should be displaced by the introduction of the blades of the axis traction forceps if care is taken to see that in the guiding of the blades only two fingers are gently introduced into the vagina. As far as traction with the ordinary forceps is concerned we have already stated that only the minimum force necessary should be used, and maternal injuries should not be any greater than with Kielland's forceps.

CHAPTER XLVII

VERSION

By this operation the presentation of the foetus is changed so that either the cephalic or the podalic pole is substituted for the existing presentation.

Version is one of the oldest of obstetric operations, and was the only method of delivery available in cases of difficulty.

obtain a live child before any of the obstetric instruments, particularly the forceps, were invented.

Classification. There are two methods of classification adopted: the first, according to the part of the foetus which is brought down to the pelvic inlet; and the second, according to the manœuvre by which version is performed.

Depending upon the part that is made to present at the pelvic inlet, version may be classified as:

1. Cephalic version, and 2. Podalic version.

Depending upon the manœuvre that is adopted, there are three varieties of version, namely:—

- (1) External version.
- (2) Bipolar version—or combined external and internal version; or Braxton-Hicks' version.
- (3) Internal version.

These different forms will be considered *seriatim*.

Cephalic Version

The object of this manipulation is to substitute the vertex for a less favourable presentation. Thus, in cases of breech or shoulder presentations, the cephalic pole may be brought to present at the pelvic inlet.

Theoretically, cephalic version is indicated whenever an abnormal presentation occurs, as with the cephalic pole presenting, the prognosis for the foetus is better, provided the head can pass through the pelvis, either spontaneously or with legitimate aid by forceps.

Cephalic version is, however, not indicated in cases of placenta prævia, presentation of the cord, and may not be advisable in slight degrees of flattened pelvis.

It can be done either by external manipulation or by combined internal and external manipulation.

Podalic Version

Here, the podalic pole or breech is substituted for the presenting part.

Podalic version is particularly indicated:

- (1) In cases of transverse or oblique lie, and for two reasons we prefer this to cephalic version:

- (a) Where a transverse or oblique lie is converted into a breech presentation, either in the last few days of pregnancy, or early in labour, the change once again

to an oblique lie, should it occur as the breech will still be in the course of labour, so that it may pass into a podalic presentation.

- (b) In the majority of cases of breech presentation, if the patient is in labour and the cervix is ruptured, podalic version is possible for correction of presentation.

(2) In cases of placenta prævia, as the arrest of hæmorrhage and to complete delivery.

(3) In cases of prolapse of the cord, immediate delivery, when the head is on the brim of the pelvis and the cervix is dilated, cannot be done, with a view to minimisation of the cord by the presenting part.

(4) In some cases of cephalic presentation, complete extension, such as face, brow or occipito-posterior positions.

(5) Where the head does not enter the pelvis, the patient has been in labour for some time, disproportion particularly in multipara.

(6) In cases of compound presentation, where the head is above the brim.

(7) In minor degrees of flat pelvis, where a safer method of delivery for the mother is required.

DIFFERENT METHODS OF PER

As has already been stated, the following methods of version are available.

External Version. When external version is possible, the position of the foetus can be changed to podalic presentation. The indications for external version have already been stated.

Certain conditions are essential for external version. These are:—

- (1) The membranes should be intact, and there should be sufficient liquor amnii to permit of the foetus *in utero*.
- (2) The uterus must be fairly lax.
- (3) The abdominal muscles must be relaxed, to allow of the external manipulation of the foetus.

- (4) The presenting part should not have entered the pelvic brim.

When should external version be performed? It is generally held that when any abnormal presentation is recognised by abdominal palpation at an antenatal clinic, the obstetrician should correct the presentation into a more favourable one. This is always done by the external method of version. In the majority of cases, correction at a period of pregnancy earlier than the thirty-sixth week is unnecessary, as the foetus tends itself to assume a more favourable presentation in the later weeks of pregnancy. It may, however, be held that the woman may go into labour prematurely, in which case the abnormal presentation will undoubtedly increase the foetal risks. But here the foetus is small and the malpresentation more easy to deal with. While, therefore, the necessity of converting every abnormal presentation into a more favourable one when first recognised may be accepted in theory, emphasis should be laid on the fact that not infrequently these positions tend to change spontaneously. Again, the patient should always be warned that where version has been effected, it should not be considered as a final correction of the malpresentation. Under such circumstances the patient should be cautioned about the possibilities of a malpresentation recurring, and told that the safest course for her is to seek obstetric aid as soon as labour begins. Frequent visits to the antenatal clinic at intervals of a week help to determine whether the presentation has again recurred.

When a patient is in labour, external version is possible only in the early stages:—

- (a) Before the presenting part has engaged in the pelvic brim.
- (b) Before the membranes have ruptured, and
- (c) Before the uterus has begun to contract strongly.

There are certain dangers and difficulties associated with external version which, though infrequent, must be borne in mind:—

(1) One of the difficulties is that in the process of manipulation some part of the foetus may be caught against the uterine wall and there may be a tendency for premature separation of the placenta to occur.

(2) In cases of extended breech it is not easy to change the presentation into a cephalic presentation, as the extended legs act as splints and prevent dorsiflexion of the foetus. Gentle manipulations are necessary and the foetal heart should always be watched,

as also the general condition of the patient. It is therefore inadvisable to give an anæsthetic to the patient before performing external version. Anæsthesia may be rarely indicated in those cases where the patient is extremely nervous and holds the abdominal muscles rigid, or in the first stage of labour where the uterus is irritable and manipulations provoke a contraction. Even under such circumstances, light anæsthesia is to be administered, and the condition of the patient carefully watched. In cases of abnormal presentations where external version is contemplated it is wise to take an X-ray to note the exact position of the foetus and any abnormalities that may be present.

Technique. The manipulation consists in :

(1) Carefully locating, by abdominal palpation, the different parts of the foetus, particularly the breech and the head and the position of the back of the foetus.

(2) One hand is placed over the breech, the other over the cephalic pole, and by alternate light pushing manœuvres, the pole which is to present at the pelvic brim is brought down, while the opposite pole is gradually pushed towards the fundus.

Time should be taken in these manipulations, and no attempt should be made to change the position by any jerky or sudden movement, as the uterine ovoid must gradually accustom itself to the changing foetal ovoid.

(3) After the version has been completed, the foetus should once more be carefully palpated to ascertain definitely that the desired presentation has been obtained, and to define its position.

(4) It is desirable to watch the foetal heart carefully during and after the manipulation.

An abdominal binder is applied at this stage to steady the foetal ovoid and so allow the presenting part to become engaged in the pelvic brim. If the woman is already in labour, the membranes should be ruptured so that the head may fix, and a tight abdominal binder is applied. Where external podalic version has been carried out, as in cases of placenta prævia, a foot may be brought down through the cervix and left in the vagina after rupturing the membranes and the further delivery left to natural efforts.

It is desirable that the woman should be kept in bed after external version during the first stage of labour.

Bipolar or Combined Version. This is also called Braxton Hicks' method, as he was largely responsible for evolving the correct technique and popularising this method. By the

manœuvre, either the cephalic or podalic pole of the foetus may be substituted for the presenting part. The indications have already been discussed.



FIG. 188.—Bipolar or combined version. (Schematic representation).

This method of version is adopted when the woman is already in labour. The following conditions are necessary for its successful performance :—

- (1) The os should be sufficiently dilated to admit at least two fingers.
- (2) The membranes should either be entire or recently ruptured, with a sufficiency of liquor amni to allow of free movement of the foetus within the uterus.
- (3) The uterine muscle must be relaxed.
- (4) The abdominal wall should be lax and not unduly laden with fat.

Technique. The patient is anaesthetised and placed in the lithotomy position. Strict antiseptic precautions should be taken and the vulva prepared as for any obstetric operation. The position of the foetal parts must be carefully mapped out by abdominal palpation and the bladder emptied. The operator then introduces one gloved hand into the vagina and two fingers of this hand into

the cervical canal, so as to reach the presenting part. The other hand is placed on the abdominal wall and by pushing the presenting part away from the pelvic brim with the fingers in the cervical canal, and simultaneously gently pushing the opposite pole towards the pelvis, the position of the foetus is changed by gradual manipulations, so that the particular pole which is to



FIG. 189.—Bipolar or combined version—I stage.

present is brought to the pelvic brim. After the presentation has been changed, the membranes may be ruptured, a tight abdominal binder applied, and the patient kept in bed. If the presentation has been changed into a podalic one, a foot may be brought down after rupture of the membranes if necessary, and left in the vagina, so that further delivery may take place by natural efforts.

Internal Version. Internal version is always podalic. The smooth, round head cannot be grasped satisfactorily by the hand in the uterus and brought down to and kept in position.

the pelvic brim. While, therefore, external version and bipolar version may be either cephalic or podalic in type, it must be clearly realised that internal version will permit of change of presentation to a breech only.

Internal podalic version may be adopted in several circumstances, and the indications will increase with the experience of the obstetrician in the performance of internal podalic version and extraction. While we do not agree with Potter of Buffalo that the routine method of delivery in all cases should be version and extraction, we feel that internal podalic version, as a safe method of delivery, has a place in the treatment of many cases where the obstetrician at present adopts more radical methods. Few are prepared to support Potter, for it must be realised that in the great majority of cases nature's method is the best method of delivery, and any operative technique which radically interferes with the immense potentialities of nature in regard to a safe delivery both for the mother and the child, should, in our opinion, be discouraged. We, however, feel that with experience and a correct appreciation of the technique involved in version and extraction, the obstetrician will find it a useful method of operative delivery in a greater proportion of cases where the alternatives are a Cæsarean section, high forceps, or a perforation.

Indications.

- (1) Transverse and oblique lie.
- (2) Prolapse of the cord.
- (3) Brow presentation, face or glabellar presentation—with the chin posterior, certain cases of occipito-posterior position, and certain of the deflexion attitudes of the foetus where the cephalic pole does not enter the brim of the pelvis.
- (4) In some varieties of compound presentation.
- (5) In selected cases of placenta prævia, and in certain cases of accidental hæmorrhage.
- (6) In cases where a rapid method of delivery through the natural passages is indicated, provided the conditions necessary to perform internal podalic version safely are present.
- (7) Occasionally in minor degree of contracted pelvis of the flat variety.

Conditions necessary for the safe performance of internal podalic version :—

- (1) The cervix must be sufficiently dilated so that the whole hand can be introduced into the uterine cavity.
- (2) The condition of the uterus should permit of internal podalic version being performed. This is by far the most important condition that must be satisfied before the operation is attempted.

It is obvious that any intrauterine source of grave risk once the uterus has tonic contraction; the uterine muscle of is considerably thinned out, while the contracted and thickened. The lower segment is known as a retraction ring or attempts to change the position of the ring is demonstrable clinically, may ca thinned-out lower uterine segment the podalic version is, therefore, contraind stances; but occasionally, if the foetus chance of surviving delivery, if relaxe maximum extent possible can be obt anaesthesia, version may be attempted l cian. If such an experienced operator i not hesitate to effect delivery by one o involve destructive operations of the fo mother and child.

Where, however, the uterus is c version is by no means difficult, provi described in the technique are followe the case.

(3) The patient should be anaesthe a deep degree of anaesthesia, should l In fact, if internal podalic version is stances where the uterus is already Bandl's ring is present, a very deep deq sary to allow of the maximum relaxat and uterine musculature. In some ca administer a narcotic like morphia (qua anaesthesia with chloroform is given.

(4) The presenting part should n the pelvis—at any rate, it should be lodged to allow of the hand being i cavity so that the subsequent manipula

Technique. The operation should fully weighing all the factors involved the conditions described above are pr pared as for a major obstetric operation and cleaned and the bladder emptied. she is then brought to the edge of the dorsal position. Great care should be cautions, and the operative field prot

and sheets. It is advisable that the patient should be brought well down to the edge of the bed, so that a portion of the buttocks may be free. We prefer two assistants supporting the legs, one on either side, so that the thighs do not press against the abdominal wall. The abdominal wall itself is covered by a sterilised towel thrown over it. When the patient is well under chloroform, the operator separates the labia with one hand and passes the other



FIG. 190.—Internal podalic version. One hand in the uterus the other steadying the fundus.

gloved hand, formed into an obstetric cone, gradually into the vaginal cavity and then through the cervical canal into the uterus. The other hand is now placed on the sterilised towel over the abdominal wall to manipulate the foetal parts in the later stages of the operation. The hand in the uterus is guided past the presenting part, till it reaches a foetal knee. Slight pressure on the posterior aspect of the knee causes flexion of the leg, and the index finger is then hooked round the flexed knee and gentle traction applied on the knee to bring the leg into the lower uterine segment. It is important that the value of this manipulation should be appreciated, particularly when the uterus is approaching tonic contraction and there is not a sufficiency of liquor amnii in the uterus as, for example, in a case of shoulder presentation. In spite of the deep anaesthesia, the uterus will not relax to permit of the obstetrician's hand being stretched to grasp the foot of the foetus, especially when this is in the upper uterine

segment. For this reason, it is desirable to grasp the fingers and pull at the knee, instead of grasping the foot and bringing it down. With traction, the knee will be brought down to the segment, when the finger can be slipped under the leg and the foot got hold of by the thumb. The foot can now be gently brought out of the vulva. At this stage it may be manipulated by the hand on the



FIG. 191.—Internal podalic version.
Note the mode of grasp.

of the foot coming more easily than the head, guide the head into the uterine fundus.

Considerable emphasis has been laid on the mode of grasp, and which of his hands the operator thinks a good working rule is to use the hand he is accustomed to work with, preferably the right hand. Occasionally, when the force of the uterine contractions is insufficient to produce the left hand to complete the version, the consideration it is an advantage to use the right hand as, if the posterior foot is brought

hitch above the symphysis pubis, over-ride it, and prevent the descent of the foetus. If the manipulations to which we have referred when considering the extraction of the breech be borne in mind, it will easily be seen that with a slight rotatory movement during the further extraction of the body of the foetus, this difficulty is not likely to arise, even if the posterior limb is brought down first.

In the process of internal version done under conditions where the uterus is really tonically contracted, considerable difficulty is experienced in reaching a lower limb, and it may be an impossible task to get at the anterior limb, whereas the posterior one is within reach. For this reason, we do not lay much emphasis on the particular limb that should be brought down, and we feel that most obstetricians who have had experience of internal podalic version under these difficult conditions of strong uterine activity, will agree with us that one is thankful to get hold of any foot and bring it down. It is of value, however, to emphasise the fact that whichever foot is brought down, it is necessary, in the subsequent extraction of the foetus, to see that the leg is so rotated as to bring the back of the foetus anteriorly.

When one foot has been brought out, we do not think there is any necessity to reintroduce the hand and attempt to bring down the other foot also. We would go further and say that it is a great mistake to waste precious time and expose the woman to additional risks of sepsis and possibilities of hæmorrhage due to further delay. Nor do we think it is of the least use trying to get hold of both feet simultaneously and so bring them down, as this is bound to fail in the really difficult cases of podalic version.

The subsequent stages of delivery of the foetus have been referred to in the chapter on breech presentation. Once the position of the foetus has been altered, the question whether immediate delivery is indicated or not must be decided by the condition of the foetus and of the mother. But in all cases where immediate delivery is indicated, it is of importance to give sufficient time in the subsequent manipulations of extraction to allow the uterine ovoid to adjust itself to the altering position of the foetal ovoid. It may also be mentioned here that this amount of manipulation of the foetus has a definitely adverse effect upon the foetal heart, so that some little time should be given for the foetus to recover from the shock of the manipulation before extraction is proceeded with.

Prognosis. In properly selected cases the prognosis should be good, so far as the mother is concerned, as little or no damage need be done to the maternal soft parts. There is, however, the in-

creased risks of sepsis following an intrauterine manipulation, as infection may be carried into the uterus from the lower genital tract. In cases where the operation is undertaken at a late stage of labour, there is a risk of rupture of the uterus, but as we have already stated, the operation under these circumstances should only be undertaken by an expert.

So far as the foetus is concerned, the prognosis depends upon the nature of the indication for the operation, and the conditions under which extraction of the child has to be attempted. With marked pelvic contraction, the mortality is necessarily high. Asphyxia, intracranial injuries, fractures of various bones, may all add considerably to the risks of the foetus.

The prognosis in bipolar version will be favourable both to the mother and the foetus. If performed under proper conditions and for true indications, both bipolar and external version should be perfectly safe operations and should involve no additional risk either to the mother or the foetus.

Destructive Operations on the Foetus

Unfortunately it is sometimes necessary to perform destructive operations on the foetus with a view to diminish its bulk and so facilitate delivery and thereby save the mother. It is generally agreed that such operations should be done only on the dead child. With the increasing knowledge of the technique of the various obstetric operations whereby a live child may be delivered, and with a better appreciation of the optimum time for such operations to be performed, it ought to be very seldom indeed that one is called upon to destroy a living child. Still, it must be confessed that occasionally one is faced with a case where, in the interests of the mother, the only course open is to perform a destructive operation on the foetus. The relieving feature in such a case is that although the child is still alive, it has been subjected to so much stress by the course of labour or by previous unsuccessful attempts at delivery that its chances of subsequent survival are small. Delivery of such a foetus, will generally result in the child being still-born, or deeply asphyxiated and difficult to resuscitate, or it may succumb in the neonatal period of its existence. Conscientious objectors there are, and especially those of a particular religious persuasion, who strongly believe that it is no right of the obstetrician to perform any destructive operation on the child so long as there is any suggestion of life. We respect these feelings, but it is a moot point whether one is justified in withholding such help as is possible to afford

to save the mother, till after the death of the foetus. Religious and conscientious objections apart, the practical obstetrician realises that in a few cases he has to face a situation when, much to his regret, he must destroy a living child in order to give the mother a chance to survive. There is no need to emphasise the grave responsibility that devolves upon the obstetrician when confronted with such a situation. The greatest possible care must be taken and the pros and cons well discussed and all the relevant points thoroughly appreciated before such a serious decision is ever taken. It is desirable and wise to acquaint the relatives, and very occasionally the mother, of the circumstances under which such an operation is inevitable, and obtain their consent before resorting to it.

Included under the terms "embryotomy" or "embryulcia" are the following destructive operations that may be performed on the foetus.

(1) Craniotomy combines three steps: (a) Perforation, wherein the foetal skull is opened into by a perforator and the cranial contents evacuated. (b) Cranioclasm or cephalotripsy, whereby the head is comminuted and its size reduced. (c) Extraction of the child.

(2) Decapitation. In this operation the head is separated from the trunk by cutting through the neck with a special decapitating hook, or a knife, or a pair of scissors.

(3) Cleidotomy consists in cutting through the clavicles, so as to reduce the bisacromial diameter when the child has too broad shoulders.

(4) Evisceration. The removal of the viscera from the abdominal or thoracic cavity after opening the abdominal or the thoracic wall.

(5) Spondylotomy is the term applied to cutting through of the spinal column and the division of the trunk of the foetus into two halves.

Craniotomy

Indications :—

(a) *When the child is dead:—*

1. When the head is hydrocephalic.
2. Where disproportion exists, and delivery is impeded owing to a contracted pelvis or a large child, provided reduction in the size of the head will permit of delivery.

3. For the delivery of the after-coming head.
4. In occipito-posterior or mento-posterior cases, when other methods of vaginal delivery have failed or are inadvisable.
5. In some cases of locked twins it is necessary to perforate one of the twins with a view to effect the delivery of the second twin.

(b) *When the child is living:* (The precautions to be taken before resorting to craniotomy in such circumstances have been detailed in the introduction to this chapter).

1. Hydrocephalus is an indication for craniotomy. Cæsarean section would result in the delivery of a child with little prospect of survival, and, if it did, the certainty of mental deficiency.

2. In cases of prolonged labour, when the head is jammed in the pelvis and the foetus shows evidence of distress, and there is possible infection of the genital tract. The alternative under such circumstances is a Cæsarean hysterectomy, but it must be clearly realised that this operation results in the delivery of a very much damaged child, born alive perhaps, but with little chance of survival. Even if the uterus is removed the chances of peritonitis are considerable. Again, the removal of the uterus after the section results in permanent sterility, and is not to be lightly undertaken merely with a view to gratify one's pride in not resorting to craniotomy. For similar reasons the withholding of in cases of occipito-posterior or mento-posterior positions jammed in the pelvis, in favour of a difficult forceps delivery which damages the maternal tissues irretrievably, and results in the delivery of a foetus that is still born or does not survive has very little to commend itself.

3. Craniotomy may also be the only possible method in certain cases of cephalo-pelvic disproportion when institutional facilities are not available for the major operative methods of delivery. We do not consider it justifiable that the tremendous responsibility incidental to other methods of delivery should, under such circumstances, be lightly undertaken. It is preferable to face a craniotomy rather than increase the risk to the mother and still lose the child after Cæsarean section.

Conditions. Craniotomy should be undertaken only when it is possible to deliver the foetus through the natural passages. In the extreme degrees of contracted pelves, it is not justifiable, and operations like basilectomy and cephalotripsy are not without serious risks and may ultimately fail to deliver the foetus. Such prolonged operations are infinitely more risky from the point of

view of the mother than a Caesarean hysterectomy, and we are convinced that the sooner the obstetrician gives up such destructive operations as basilectomy and cephalotripsy the better. We have had no occasion to perform such operations for a very long period now.

Before craniotomy is undertaken the cervix must be fully dilated.

Technique of the Operation. There are three stages in the operation of Craniotomy: (1) Perforation; (2) Cranioclasm or cephalotripsy; (3) Extraction. The preparations are as thorough as for delivery with forceps. In fact, great care is needed in these cases, as the large majority are brought to the obstetrician late in labour, when the possibilities of sepsis are by no means small.

Perforation. The patient is given a general anaesthetic and put in the lithotomy position. After the preliminary toilette of the field of operation has been completed and the bladder has been emptied, the head is perforated. The first step in the stage of perforation is to fix the presenting part, namely, the head. This can be done by one of two methods: (a) By an assistant applying suprapubic pressure, or (b) by the application of forceps to the head. We prefer the latter method, as it steadies the head very efficiently, and after perforation, in the majority of cases, permits the head to be delivered with ease by traction on the forceps. If this precaution of fixing the head is not taken, the chances are that the perforator may slip, as the head recedes under its pressure and thus cause serious damage to the maternal soft parts, in some cases perforating through the anterior vaginal wall and the bladder.

The head having thus been fixed by the application of forceps, the perforator is grasped in the right hand, two fingers of the left hand are passed into the vagina to locate the seat of perforation, the perforator guided along the palmar aspect of the fingers and applied to the head, and the point fixed against the most prominent bony surface of the cranium; it is then pushed through the skull by a slight drilling movement, and as soon as the blades have pierced the skull, they are opened so as to cause a longitudinal slit. The perforator is then closed, turned at right angles, and reopened so that a crucial incision is made in the skull bone. Occasionally, when it is desired to make a large-sized opening, it may be necessary to turn the perforator through the two oblique diameters of the opening and allow the blades to be opened in the same manner as has just been described. When the hole has been

made in the bony skull the perforator is passed into the brain substance which is then stirred up. Once the brain has been broken up, the instrument is passed into the floor of the cranial



FIG. 192.—Craniotomy. The perforator has been introduced into the vagina guided by the fingers and steadied against the head, which is fixed in position by the preliminary application of forceps.

cavity and the medulla oblongata and the commencement of the spinal cord destroyed.

A point of some importance is the situation of the opening to be made in the skull. It is not desirable to perforate through a fontanelle or a suture, as, when the perforator is removed and an attempt is made to deliver the head, the skull bones tend to overlap and thus close the opening, preventing the further escape of brain substance. We therefore strongly advocate perforation through bone and not membrane. The exact site of the perforation depends upon the presentation. In cases of vertex presentation it is through a parietal bone, near one or other of the fontanelles. In cases of brow presentation, it is through the frontal bones; in a case of face presentation, through the orbit or the roof mouth.

and in an aftercoming head it is through the occipital bone near the posterior fontanelle.

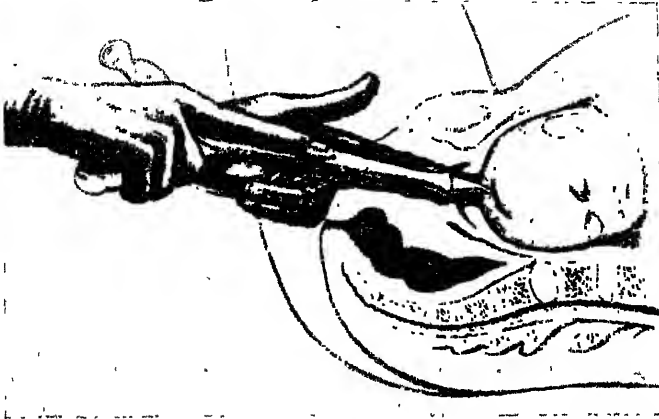


FIG. 193.—Craniotomy. Longitudinal slit made by the perforator.

After perforation has been effected it is not necessary to remove the perforator. The forceps having been applied, as already stated, the perforator is left *in situ* and traction is applied. The traction should be gentle, as otherwise the chances are the forceps may slip. This is particularly so in occipito-posterior and mento-posterior positions. If occasionally there is resistance still felt in the progress of the head, the perforator may be used to stir up the brain contents a little more, to allow the brain matter to be squeezed through the perforated hole. We have never felt the necessity for washing out the brain material—a procedure suggested by some obstetricians. If the perforator thoroughly stirs up the whole of the brain matter, it converts it into such a fluid pulp that it escapes with little difficulty, as the skull bones collapse by the pressure exerted on them by the pelvic walls.

It is of the greatest importance to see that the perforator is sharp. With a blunt-edged perforator the dangers of the instrument slipping are much greater, especially as a much greater amount of force is required.

In some types of perforators the blades have a slight curve. In passing such perforators along the fingers, it is necessary to see that the convex surface is in apposition with the palmar aspect, so that the point of the perforator may not injure the operator's hand or the pelvic wall. When the Simpson's perforator is introduced, the operator should familiarise himself with the method of locking and unlocking. Of the several perforators in the market, we prefer Oldham's or Simpson's model. The scissors type of per-

forator does not allow of sufficient force being exerted in the opening of the blades so as to cut through the skull bones, and from this point of view it is not as satisfactory as the other patterns that we have just mentioned.

Prognosis. In a destructive operation such as this, the prognosis depends upon several factors, not the least important of which are the circumstances under which the operation is necessitated, and the general condition of the mother. The greater the previous amount of handling, the greater is the risk of sepsis and the graver is the prognosis. If done with care, and in cases where no contraindications exist, such as extreme degrees of contracted pelves, the operation may not be attended with any increased risks so far as the mother is concerned. It is not justifiable to attribute to craniotomy the risks incidental to prolonged labour and infection of the case prior to resorting to the operation. The gross mortality in such cases is decidedly high, and the morbidity is even higher, but it must be realised that in the majority of cases the causes are extrinsic, rather than intrinsic, so far as the particular operation is concerned.

CRANIOCLASM

The alternative method to forceps for extracting the head after perforation is the application of the cranioclast. This instrument consists of a solid blade which is introduced through the perforation hole in the skull until the tip of it impinges against the base of the skull, while the fenestrated blade is applied in the same manner as one of the blades of the forceps, to the outer surface of the skull. The screw is tightened after the application of the two blades, so that the vault of the skull is compressed and a firm hold is obtained for the extraction of the foetal head.

The advantages of the cranioclast therefore are :—

- (1) That it secures a very firm hold of the foetal head, and
- (2) That it crushes a portion of the skull and thus diminishes the size of the head still further than has been done by the preliminary perforation.

In cases, therefore, of the more severe types of contracted pelves, it may be necessary to use the cranioclast for the extraction of the head. Occasionally, in such cases, the pelvis may be so contracted that a still greater amount of crushing of the head is necessary before it can be extracted. Many instruments have been devised to do this, but the three most commonly used are :—

- (1) The cephalotribe.
- (2) Basilyst with tractor.
- (3) Combined cranioclast and cephalotribe.

CEPHALOTRIPSY

ties of cephalotribe, one of the best being it consists of two heavy fenestrated blades skull on either side after perforation. By end of the handle, the blades are approxi- ult of the skull completely crushed. It he size of the vault of the skull, but one s is that the head frequently slips from

BASILECTOMY

he vault of the skull alone may not be ery of the head. Difficulty in these cases e skull, which is a hard bony structure, lovetailed into one another, and united by ient called a basilyst has been devised to kull. In the Simpson's basilyst there is a the operation of basilectomy is done, the extract the crushed head.

nsists of a strong metallic drill, which can accessory blade like one of the blades of perforation, the metallic drill is passed and fixed into the base of the skull. A se of the skull by the drill, which is then s of the base of the skull are fractured in ary movement facilitates this procedure. een destroyed, the outer blade is applied, basilyst tractor is then used for extracting the pelvis.

is instrument is that it destroys the base aterially the size of the skull, and also anioclast.

RANIOCLAST AND CEPHALOTRIBE

rm of three-bladed instrument, the head small size by simultaneously performing tripsy. One blade is passed through the r perforation, and this, by a drilling move- of the skull. The other two blades are f the head and all the three blades are ong screws, which, when tightened, crush lades are kept in position by the two lle. When traction is gently applied, the livered without difficulty.

Prognosis. Cases which necessitate these drastic methods of reduction of the size of the foetal head are generally cases which have been neglected and come to the notice of the obstetrician at a late stage of labour. It may be stated that the morbidity and mortality are definitely higher when these crushing operations are performed. It is rarely that such extreme measures are required for the delivery of the foetal head.

Decapitation

In this operation the head is severed from the trunk by cutting through the neck.

Indications. (1) In cases of neglected shoulder presentation with arm prolapsed where the uterus is tonically contracted, Bandl's ring is present with signs of imminent rupture of the uterus and the child is dead, the safest method of delivery for the mother is decapitation.

(2) In some cases of locked twins, when the after-coming head of the first child is impacted by the head, shoulder, or body of the second child.

(3) In double-headed monsters where decapitation of one head is necessary before the delivery of the monster can be effected.

Technique. Several instruments may be used to effect decapitation. It may be done either :

(1) By the use of hooks, such as Braun's blunt decapitating hook, Ramsbottom's decapitating knife, Galabin's decapitating saw, or Jardine's decapitating hook with cutting knife; or

(2) By the use of a long pair of sharp-edged, blunt-pointed scissors.

In cases of neglected shoulder presentation, a sling is tied to the prolapsed arm and an assistant makes firm traction on it, so that the shoulder is fixed in the pelvic cavity and the neck comes nearer the pelvic outlet. The operator passes two fingers of his left hand along the shoulder on to the groove of the neck, anteriorly. The decapitating hook is guided along the palmar aspect of the two fingers, and after it has reached the groove of the neck it is gently rotated through a right angle, so that the knob of the hook is directed posteriorly. The hook then grips the neck firmly, and by rotating the instrument the tissues are cut through and the spinal column disarticulated and completely separated. Where the separation of the soft parts cannot be easily effected by means of the blunt hook, a pair of scissors may be used to divide them.

important to realise that no sudden force should be exerted in cutting through or twisting the soft parts with the hook, as otherwise it may slip and impinge upon some of the maternal soft parts and damage them. For the same reason, the hook should never be

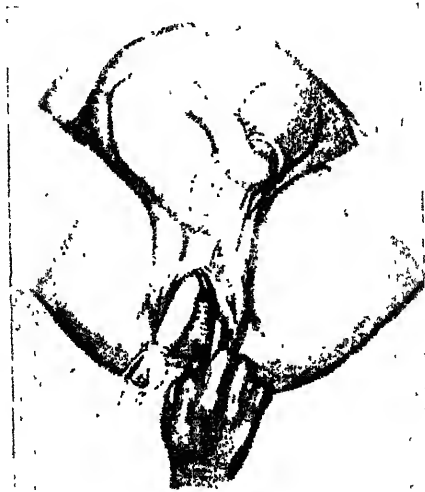


FIG. 194.—Decapitation. The hook *in situ*.
Note that the knob is directed posteriorly.

passed with the blunt knob directed anteriorly, as, if by any chance the hook should slip, the knob may seriously damage the soft structures and even perforate the bladder.

Decapitation can be done with scissors, provided care is exercised in performing the operation so that the maternal soft parts or the operator's fingers are not injured. The prolapsed arm is pulled down by an assistant; the operator passes two fingers of his hand on to the neck; then the scissors are passed along the palmar aspect of the fingers and applied to the neck, and gradually portion after portion is cut through, under the guidance of the fingers. We have practised decapitation with the use of the blunt-pointed scissors and feel that, with a little caution, no accident need occur. The ordinary decapitating scissors, however, are quite useless, and we prefer a straight, fairly long pair of scissors, sharp edged and blunt pointed. When decapitation is done with a pair of scissors the last few shreds of the tissues may not easily be cut through, but if traction is made upon the arm that is already prolapsed, it will be easy to get the finger of the operator around these shreds and separate them, or they may gently be cut with scissors.

EXTRACTION AFTER DECAPITATION

After decapitation has been effected traction should be exerted upon the prolapsed arm, when it will be found that the foetal body is easily delivered.

After the delivery of the headless trunk, the head may be delivered by any of the following methods:—

- (1) By fundal pressure.
- (2) By passing two fingers into the mouth of the decapitated head and delivering it with fundal pressure and traction from below, as in the delivery of the after-coming head.
- (3) Applying a crotchet into the mouth of the foetus, and by traction delivering it.
- (4) The head may be fixed by a vulsellum or by suprapubic pressure, and the obstetric forceps applied and delivery completed.
- (5) In cases where there is any difficulty due to contracted pelvis, perforation and extraction with the cranioclast or cephalotribe should be the method of choice.

Cleidotomy

By this operation is meant the division of one or both the clavicles, with a view to diminish the biacromial diameter of the dead foetus, when there is difficulty with birth of the shoulders. It may be necessitated in cases of generally contracted pelves, or pelves contracted at the outlet, or it may be due to an excessively large child or an anencephalic monster. The head may have been delivered naturally, or after perforation. The further progress is impeded by the shoulders becoming wedged in the pelvic cavity. When this happens, the simple operation of cleidotomy may be performed by cutting through the clavicle with a pair of scissors passed under the protection of two fingers introduced into the vagina, along the anterior aspect of the shoulder. Generally, cleidotomy on one side is sufficient, but in extreme cases it may be necessitated on both sides. After cleidotomy, the child is delivered by traction on the head, or in some cases by traction on the head combined with traction exerted by a hook passed through the axilla of one side.

Occasionally, in the delivery of a large macerated foetus, particularly for instance, in a diabetic patient, the obstruction by the shoulders is very pronounced. Any attempt, after cleidotomy, at traction on the head may lead to laceration of the macerated muscles of the neck and even separation of the head. Under such circumstances, it may be necessary carefully to pass the hand into

the vagina to one side, flex one forearm at the elbow, grasp the wrist, and deliver the limb by gently pulling it out. There is then a better hold for traction, and the wedge having been broken up, the child can usually be delivered; in some cases it is necessary to



FIG. 195.—Cleidotomy.

bring down both arms and then introduce a crotchet into the chest of the child, and hook it against the ribs before finally extracting the macerated foetus.

Evisceration

By this is meant the opening of the thorax or abdomen, or both, and the removal of their contents.

Indications. (1) In cases of neglected shoulder presentation, where the arm is not prolapsed and the neck is not within reach for decapitation to be performed, evisceration is necessary before spondylotomy can be thought of.

(2) Where undue enlargement of the thorax or abdomen is present, due to tumours, hydrothorax, congenital anomalies, foetal ascites, cystic kidney or distended bladder.

Technique. The operation can be done with the perforator or with a straight or curved pair of scissors. Whatever instrument is used, the maternal parts should be carefully protected from injury, and the instrument always guided along the fingers of the operator



FIG. 196.—Embryotomy in a case of shoulder presentation.

passed into the vagina. When perforating through the thorax it is necessary to make a fairly big opening, which can best be done by cutting away several segments of the ribs so as to make evisceration possible.

Spondylotomy

In this operation the spinal column of the foetus is divided and the trunk is cut into two halves.

This is done in cases of neglected shoulder presentations, where the neck is too high for decapitation to be performed and where the arm is not prolapsed. In such cases the uterus being in a state of threatening rupture and the child already dead, version is absolutely contraindicated, and the only safe method of delivery is to divide the trunk into two and deliver each half separately.

Mode of Operation. The operator passes his fingers against the spinal column of the foetus, and first cuts through the structures of the abdominal wall, with a view to evisceration

its contents. The spinal column in the lumbar region can then be hooked round by the finger, and with a powerful pair of scissors cut through into two halves. Further separation of any of the soft structures can be easily done, when the body has been completely divided into two halves, each half being separately delivered by traction. The first half to be delivered should be the lower half of the foetal trunk, and this can be done by applying a strong pair of vulsella on to the divided end of the spinal column and pulling, so that the pelvis and lower extremities are extracted. Later, the



FIG. 197.—Spondylotomy. Delivery of the distal half of the body after spondylotomy.

upper half, can be delivered by pulling upon the divided spinal column and extracting the trunk in a manner similar to that adopted in the delivery of a breech presentation. If any further difficulty arises in the delivery, such destructive operations as cleidotomy or perforation may also have to be performed.

CHAPTER XLVIII

CÆSAREAN SECTION

Varieties. We have repeatedly referred in previous chapters to delivery by the abdominal route. There are several variations of operation that may be undertaken when delivery by this route is decided upon. Chief among these are:—

- (1) Elective or Classical Cæsaean section.

- (2) Lower Segment Cæsarean section or laparo-trachelotomy.
- (3) Extraperitoneal Cæsarean section.
- (4) Cæsarean hysterectomy (subtotal or total).
- (5) Porte's operation.

The particular method of operation to be chosen in any particular case depends upon a variety of circumstances, which are considered later.

Indications. The indications for Cæsarean section may be broadly grouped under the following heads :—

- (1) Faults in the passages.
- (2) Faults in the passenger.
- (3) Faults of the forces.
- (4) Other maternal conditions.

Before dealing with each of these separately, it may be stated that the indications for Cæsarean section may be grouped as absolute or relative. An absolute indication is said to exist when it is impossible even for a mutilated foetus to be delivered *per via naturalis*, because of an extreme degree of contraction of the pelvis, or because of tumours obstructing the passages, or because of conditions in the vagina or of the cervix which make such delivery impossible. A relative indication is said to exist when Cæsarean section offers the safer method of delivery of a live foetus, though methods of delivery through the natural passages are available.

(1) **Faults in the Passages.** In the large majority of cases Cæsarean section is performed because of faults in the passages which make it impossible for a live child to be delivered by the vaginal route, or occasionally even for a dead and mutilated foetus to be so born. Such faults may be :

- (a) in the bony passages, or
- (b) in the soft parts.

(a) **Bony Passages.** Contraction of the pelvis is the most common indication for Cæsarean section. Such contractions at the inlet, cavity, or outlet, may be so pronounced that a full-term, normally developed foetus cannot be delivered alive. It is not always easy, however, to judge of the possibilities of delivery through a contracted pelvis. As has been explained in the chapter dealing with contracted pelvis, many other factors have to be considered : it is surprising how, in some cases, where pelvimetry

alone would give the impression that a severe form of dystocia is likely to result, delivery is effected by natural powers. This is due, as has been stated already, to several factors, such as the size of the foetal head in relation to the pelvic brim and cavity, the degree of moulding, the force of the uterine contractions, and the efforts of the accessory muscles of labour. One cannot therefore lay down any specific rules as to when Cæsarean section should be undertaken taking contracted pelves alone into consideration unless it be extreme.

The border-line cases, therefore, are the ones that present the greatest amount of difficulty; and it is here that experience is valuable in enabling the obstetrician to arrive at a correct decision. While cephalometry, radiography, and pelvimetry may all be available, it should be emphasised that these are only of limited use, and must be subordinated to the experience of the obstetrician concerned in arriving at a correct judgment.

It is for this reason that trial labour has come into vogue as one of the recognised methods of treatment in border-line cases of contracted pelves. If the cases are carefully chosen, a number of them, which would otherwise have been submitted to Cæsarean sections, will be found to deliver themselves through the natural passages, either unaided or with slight help. A word of caution is necessary here as to the place Cæsarean section in cases of trial labour. To allow a trial labour to continue where it is believed that delivery by Cæsarean section will almost certainly be necessary is bad obstetrics. If there are any weighty reasons indicating delivery by Cæsarean section before allowing the woman to go through trial labour, it is more rational to perform an elective Cæsarean section in the best interests of mother and child. Cæsarean section, even if by the lower segment route, performed at a late stage in labour, undoubtedly adds risks to the mother as compared with an elective Cæsarean, and should not therefore be lightly undertaken. Unfortunately in some cases of test labour, where there is every reason to believe that labour will ultimately end through the natural passages, factors may appear which prevent this favourable termination; may be an unduly ossified head, incomplete flexion, failure of rotation, weak uterine contractions, or a resistant cervix which may lead to failure of trial labour. In such cases one may have to resort to a lower segment Cæsarean section, but these should be few and far between. It should be emphasised the fact, that a lower segment Cæsarean section should not be thought of as the last resort of the obstetrician after other methods of delivery have been attempted and failed. In fact, there

has been an error of judgment which must be frankly recognised as such when Cæsarean section has to be resorted to under these circumstances.

The distorted types of contracted pelvis may require an elective Cæsarean section, and in such cases the difficulties of arriving at a correct appreciation of the nature of dystocia are much less. Such distorted types of pelvis are the kyphotic pelvis, the coxalgic pelvis, Naegle's pelvis, Robert's pelvis, and the spondylolisthetic pelvis. The osteomalacic pelvis frequently results in such obvious deformities that there is no question about the choice of the method of delivery. The largest number of Cæsarean sections are generally carried out for this particular condition in countries where osteomalacia is common.

Contractions of the outlet sometimes lead to errors in judgment, unless careful pelvic measurements of the outlet have been made previously. Even under such circumstances it is sometimes difficult accurately to gauge the extent of dystocia that will develop, as with an outlet contraction the cephalic pole cannot be used as a pelvimeter in the later weeks of pregnancy or early in labour, as in cases of inlet contraction. For these reasons, the obstetrician should make it a rule to ascertain the exact dimensions of the pelvic outlet in all cases of primiparæ, and should, where such measurements are definitely contracted, decide early whether elective Cæsarean or pubiotomy, if necessary, will be the safer method.

There are some cases where, even with a moderate degree of pelvic contraction, it is desirable to resort to a Cæsarean section, rather than allow labour to terminate through the natural passages, or watch the effects of trial labour. Among such conditions are: elderly primiparæ with moderate contractions of the pelvis. The possibilities of a subsequent pregnancy in a woman past the middle age—certainly if over thirty-five years of age for Indian or over forty for European women—are somewhat remote, and the obstetrician is justified in avoiding any risk to the child such as a vaginal delivery is bound to entail. Apart from such foetal risks, it has to be realised that in elderly primiparæ the soft parts are rigid and somewhat unyielding; uterine contractions may not be as strong and effective as in younger women, and it is our experience that the foetus is frequently well developed—a combination of circumstances which render it more than probable that labour will be prolonged and the risks for the child consequently very much greater.

Other factors which may necessitate the choice of a Cæsarean section are: complications, such as placenta prævia, accidental hæmorrhage, prolapse of the cord, etc. When such complications exist, along with a pelvis that is moderately contracted, the chances of delivering a live child through the natural passages are very much diminished, and in the interests of the foetus, therefore, it may occasionally be necessary to consider a Cæsarean section.

In extreme degrees of contracted pelvis, Cæsarean section is the only method of delivery available, irrespective of the condition of the foetus or the stage of labour.

(b) *Soft Parts.* Certain anomalies of the soft parts may also necessitate Cæsarean section. Such may be due to defects in some part of the parturient canal, or to certain pathological conditions of the adnexa or the neighbouring organs, which materially diminish the dimensions of the parturient canal. Among the latter group of cases may be mentioned such conditions as:

- (i) Tumours of the ovary, solid or cystic, particularly dermoid cysts; multilocular cysts, ovarian teratomata, fibromata, etc.
- (ii) Parovarian cysts.
- (iii) Tumours of the bladder and rectum, stone in the bladder, etc.

Conditions pertaining to the parturient tract are:—

Fibroid tumours of the uterus, especially retroperitoneal and cervical fibroids, cancer of the cervix, atresia of the cervix, cancer of the vagina, atresia of the vagina or old cicatrized scars, sacculatation of the uterus, cancer of the vulval outlet, elephantiasis of the labium, etc. The necessity for resorting to Cæsarean section in such cases has already been elaborated in the chapter dealing with tumours complicating pregnancy.

(2) *Faults in the Passenger.* The faults in the passenger may be due to:

- (a) Size of the foetus, particularly of the head.
- (b) Malpresentations and malpositions, and
- (c) Monstrosities.

Size of the Foetus. Occasionally one meets with an over-developed foetus, where there is a relative disproportion between the foetal head and the pelvis, or the excessive size of the foetus as a whole, prevents the delivery through the natural passages. Foetuses weighing over 14 lbs. generally necessitate the abdominal

mode of delivery in the interests of the child. An unduly ossified head, as in cases of postmaturity, is another factor that has to be taken into consideration in judging if Cæsarean section is the safest mode of delivery. A hydrocephalus *per se* is never an indication for Cæsarean section. The possibilities of survival of the foetus are remote, and it is not justifiable to submit the mother to a major operative procedure on the off chance of delivering alive a hydrocephalic child, which has little or no prospect of future existence, and will be mentally defective if it does survive.

Malpresentations and malpositions may occasionally necessitate Cæsarean section. In those cases where malpresentations or malpositions are the direct result of some degree of contracted pelvis, it has already been stated that Cæsarean section may afford the safest mode of delivery. It is not to be understood, however, that malpresentations and malpositions *per se* are indications for Cæsarean section. The greatest amount of caution is necessary in arriving at a correct judgment, and one should resist the temptation to resort to Cæsarean section as a convenient method of shelving the responsibilities of the obstetrician in such cases. The ordinary modes of delivering the foetus *per vaginam* should always be considered first, and only in exceptional cases, such as an extended breech in an elderly primigravida, or a transverse lie in a primigravid woman with a rigid and undilatable cervix, or a case of brow presentation with other anomalies, or as prolapse of cord with an undilated cervix, should it be necessary to consider the advisability of a Cæsarean section.

Lastly, some types of *monstrosities* are better delivered through the abdominal route, in the interests of the mother. Double monsters, such as dicephalic thoracopagi, may give considerable difficulty even after embryotomy and particularly if they are complicated with conditions such as placenta prævia or other anomalies of the genital passages, one is justified, if the diagnosis is made early in labour, in resorting to a Cæsarean section.

It must be emphasised that foetal conditions *per se* are very rarely indications for a Cæsarean section, and while in combination with other factors they may just tip the balance in favour of it. Care must be taken to see that too frequent resort to Cæsarean section is not indulged in, on the slender ground of foetal indications.

(3) *Uterine Forces.* Occasionally, Cæsarean section may be indicated in those rare cases where a contraction ring forms. It may be an insuperable obstacle to the delivery of a living foetus through the natural passages. If the ring does not relax by any of

the conservative methods advocated, the question of a Cæsarean section, in the interests of the mother or the foetus, has got to be faced. A few cases of primary uterine inertia are also best treated by abdominal route delivery.

(4) **Other Maternal Conditions.** There are certain conditions where Cæsarean section is the most suitable method of termination of pregnancy in the interests of the mother and child. Prominent among these is *placenta prævia*. In cases of central *placenta prævia*, it is becoming increasingly recognised that it is safer, both for the mother and the foetus, to deliver by the abdominal route. In the other varieties of *placenta prævia* also, complicated with a rigid cervix, or in association with other abnormalities such as contracted pelvis, the abdominal route offers a better prognosis for the mother and child, and the obstetrician will have to weigh carefully the possibilities of safe delivery by either route.

In some cases of *accidental hæmorrhage*, particularly of the concealed variety, Cæsarean section is indicated in the interests of the mother, no matter what the condition of the foetus. In the fulminant cases of concealed accidental hæmorrhage, the only possibility of saving the mother may lie in the performance of this operation, with or without hysterectomy.

The condition of the cervix, particularly if it is undilated, is another factor which may decide in favour of a Cæsarean section.

It is a moot point whether Cæsarean section has a place in the treatment of *eclampsia*. We do not subscribe to the view that rapid methods of delivery should be undertaken as a routine in the treatment of *eclampsia*, and cannot therefore recommend Cæsarean section as a method of delivery with a view to cure the condition of *eclampsia*. We must, however, state that there are occasions when Cæsarean section may be indicated, particularly if there are other complications present, such as contracted pelvis, or malpresentations that may give rise to difficulties or undue delay in the delivery of the case.

Cæsarean section may sometimes be considered as a preferable mode of delivery in certain cases complicated with *heart lesions* or *tuberculosis*, occasionally in cases of *exophthalmic goitre*, or in certain cases of *chronic renal disease*.

Contraindications. The following contraindications for this operation should be borne in mind:—

(1) When the child is dead, or in such a serious condition of distress as to render the possibilities of its survival remote, unless there is an extreme degree of obstruction.

(2) In cases where the patient has been obviously or possibly infected by previous examinations or unsuccessful attempts at delivery, unless the condition of the foetus fully justifies the abdominal route delivery.

(3) When the patient is a poor operative risk and is suffering from any secondary disease which renders the prognosis more serious if laparotomy is undertaken.

Preparation of Patient. In the elective or classical Cæsarean section it is better not to subject the patient to any internal examination. The patient should be prepared as for any other abdominal section. It is well that the patient be in hospital for a few days before the operation, so that a careful examination may be made, a skiagram taken and the exact date of probable delivery calculated with a view to fix the date of operation. Cæsarean section, though it may appear a simple operation, is best done in well-equipped institutions. If the patient has not been subjected to any vaginal examination, it may not be necessary to apply any antiseptic internally. If, however, there has been interference, it is advisable to swab the vaginal cavity with an antiseptic such as violet green or mercurochrome before the patient is taken to the table.

Time for Operation. It has now been definitely proved that the later in labour the operation is performed the greater are the risks. The optimum time for operation depends upon several factors. In emergency cases one may have no alternative but to operate as soon as it is possible to do so. But where the elective Cæsarean section is performed, it is better that the operation be done either on the date of probable delivery, or as soon as labour begins. We prefer operating on a particular date, calculating the day as near as possible to the probable date of confinement, as under such circumstances, the patient can be submitted to a more elaborate preoperative preparation, all the facilities necessary for the operation will be available, and the operation can be done without any hurry. Where institutional facilities are available by day and by night, it is possible to operate as soon as the patient goes into labour. We have found no difficulty and experienced no complications when performing the operation before the onset of labour. The theoretical objections of imperfect lochial drainage or lack of efficient uterine contraction and retraction, are not met with in practice. One difficulty in operating before the onset of labour is that it occasionally happens that the probable date of delivery is not accurately gauged, so that the patient is delivered of a child that is not fully developed. The obstetrician should

remember this possibility and should take every precaution in ascertaining the probable date of delivery, and if he be not certain of it, it is well to wait for the onset of labour before operating.

Technique of Operation

CLASSICAL CÆSAREAN SECTION

After the preliminary preparations, the patient is brought to the table and anaesthetised. The choice of the anaesthetic is a matter for the obstetrician to decide. General, local or spinal anaesthesia may be used. In patients with cardiac disease, tuberculosis, or any other condition of shock and collapse from placenta prævia or accidental hæmorrhage, the use of a local anaesthetic should be considered.

After the abdominal wall has been properly prepared and the bladder emptied, the area of operation is painted with an antiseptic; sterile towels and sheets cover the abdomen, except at the field of operation. Besides the anaesthetist, three assistants are required to help at the operation, one to assist the obstetric surgeon, one to handle the instruments, and one to take charge of the baby as soon as it is delivered.

An incision is made in the middle line of the abdominal wall about six inches in length, the greater part of the incision being below the umbilicus. Having opened into the abdominal cavity, the uterus is found directly underneath the incision. There is no necessity to lift the uterus out of the abdominal cavity. The objection to such a procedure is that the abdominal incision has to be much longer. Eventration of the gravid uterus is not necessary in the classical or in the lower segment Cæsarean section. The uterus may be lying more to one side than the other, generally being pushed to the right side. The assistant must bring it into the median line, so that the incision into the uterus may be exactly in the median line of its anterior wall. The sides of the uterus are now packed off with gauze rinsed in saline solution, so that when the uterus is opened into, little of the material may gravitate into the abdominal cavity. With the uterus *in situ*, an incision of from 5½ to 6 inches is made in the median line. The abdominal wall can be retracted to allow of this incision being made more easily and deliberately.

Just before incising the uterus it is desirable to give 1 c.c. of pituitary extract hypodermically, to favour uterine contractions and retractions after delivery. As soon as the uterine cavity has been opened into, the operator incises the membranes, passes his

hand inside, gets a firm hold of the child by one foot and extracts it. If the uterine incision is not sufficiently long, difficulty may be experienced in the delivery of the after-coming head. It is better, under these circumstances, to pass two fingers into the uterine opening and enlarge the incision by means of scissors guided by the fingers in the uterine cavity. As soon as the child has been delivered, the cord is clamped in two places and cut between, and the child handed over to the third assistant. Immediately after the delivery of the child, the uterus is brought out of the abdominal cavity and ante flexed over the symphysis pubis; in this position, the uterine vessels are kinked, the blood supply is considerably diminished, and time is given for the uterus to recover its tonus so that it may contract and retract efficiently after separation of the placenta.

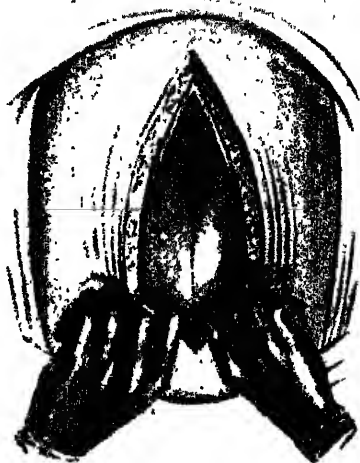


FIG. 198.—Abdominal Caesarean section : classical.
The abdomen has been opened and the line of uterine incision shown.

Occasionally the placenta may be in front and severe hæmorrhage may be encountered. The operator should not be unnerved by this hæmorrhage, but should boldly pass his hand into the uterine cavity, going to one side of the placenta or through the incised organ, rupture the membranes, and then seize the child by the foot and deliver it. As soon as the child is delivered, the hæmorrhage generally stops. After allowing the uterus to rest for some time to contract properly, the placenta should be expressed by squeezing the fundus and pushing the placenta out through the uterine incision. If this is not possible, the placenta is gently separated by means of fingers and removed with care, so that the membranes are also removed entire. Particular caution is necessary to see that the membranes covering the internal os are removed entire by passing one finger as far down as possible to the internal os and separating the membranes before they are removed. Immediately after the removal of the placenta, 1 cc. of pituitary extract and 1 c.c. of ergometrine may be given hypodermically. If the hæmorrhage does not stop, the uterus is squeezed by wrapping it with sterilised hot towels rinsed in. In the large majority of cases, the hæmorrhage stops promptly.

Where the bleeding continues owing to the laxity of the uterine musculature, an injection of 1 c.c. of pituitary extract or $\frac{1}{2}$ c.c. of ergometrine should be given directly into the uterine muscle. This helps to promote efficient contraction and retraction. In such



FIG. 199.—Delivery of the child through the uterine incision.

cases, the suturing of the uterine incision helps to control the hæmorrhage and should be begun at once.

Considerable discussion has arisen as to the best method of suturing the uterine incision, and what material should be used for the purpose. We have come to the conclusion that so long as sutures are applied to include almost the whole thickness of the uterine musculature and to bring the edges into close coaptation, it does not matter what method of suturing is adopted. Similarly, with regard to the suture material, provided it is perfectly sterile, and is not rapidly absorbed, it does not matter much what material is used, and perhaps it depends upon the individual operator's preference. We prefer silk and have had no cause to regret its selection.

One of the chief objections raised against the classical Cæsaréan section is the possibility of rupture of the Cæsaréan scar at a subsequent pregnancy. We have never experienced this, and we believe if the suturing is properly done and if sepsis is not a complication after the operation, rupture should be extremely rare.

Method of Suturing. Whatever be the method of suturing adopted, it is exceedingly important to note that the endometrium of the uterus is not included in the suture. The muscular wall may be closed in a single layer of sutures, or in two, or three layers. When a single layer of sutures is the method adopted, the suture should include the whole of the thickness of the uterine wall, excepting the endometrium. Deep sutures, six to eight in number, may be applied, and, in between, superficial sutures to bring the edges into close apposition.

Another method of suturing is to put in deep sutures for the uterine musculature, and superficial sutures to bring the peritoneal edges together. In some cases, after suturing the uterine musculature, a row of continuous sutures with catgut may be applied to cover the peritoneum over the incised area.

Among the materials used for suturing are: chromicized catgut, silk, silkworm gut, linen thread, etc.

As soon as the uterus has been properly sutured, it is well to apply a hot towel, rinsed in warm saline, and to squeeze the uterus so that any blood-clots collected inside may be expressed through the cervical canal. The uterus is then returned into the abdominal cavity. The peritoneal cavity is cleared of any blood-clots; particular care should be taken to see that any blood-clots in the lateral fossæ and in Douglas' pouch are cleared out; omentum is placed behind the uterus, and the abdomen is then closed in layers by suturing the peritoneum, the muscles, fascia and skin separately. After applying sterile dressings to the wound, the vaginal outlet should be protected by an antiseptic pad, and the patient returned to bed.

DIFFICULTIES AND COMPLICATIONS

Difficulties and complications may arise in the course of a Cæsarean section. These are:—

(1) **Actual Delivery.** The head may be engaged in the brim of the pelvis and difficulty experienced in extracting it. The uterine incision may have to be extended towards the symphysis pubis, and with traction on the legs and gentle manipulation, if necessary by passing a finger into the mouth of the foetus, the head is delivered.

(2) **Placenta.** We have already referred to the difficulty experienced when the placenta is in front and the mode of delivery of the child to be adopted in such cases.

(3) **Hæmorrhage.** Bleeding is usually controlled by injections of pituitary extract and ergometrine or by direct pressure upon the uterus, aided by hot sponges or towels rinsed dry in saline. Care must be taken to see that hæmorrhage is completely controlled.

and the uterus properly retracted before replacing the organ in the abdominal cavity. But rarely, and particularly in cases where Cæsarean section is resorted to for concealed accidental hæmorrhage, the bleeding may be so severe that nothing short of extirpation of the uterus will control it. The occurrence of hæmorrhage should not interfere with the process of suturing, as this materially helps in controlling the bleeding, both from the incised surfaces, as well as from the placental site. In some cases, direct injection of pituitary extract into the uterine musculature helps to produce proper contraction and retraction of the organ, and thus arrest the hæmorrhage.

(4) **Infection.** We shall deal later with the measures that are necessary in cases where the genital passages are obviously or possibly infected. The classical Cæsarean is contraindicated in such cases. In cases where infection is suspected during a classical Cæsarean section, the question has to be considered whether it is not desirable to remove the uterus, or alternatively to take such precautions as may be necessary to prevent the onset of peritonitis. Swabbing the inside of the uterus and the incised wound with an antiseptic such as violet green, drainage of the peritoneal cavity, injection of antistreptococcal and antiperitonitic or gas gangrene serum, etc., may have to be undertaken in such suspect cases. The use of sulphonamides in these cases has obviated the necessity for such treatment in recent years.

(5) **Adhesions.** In cases of "repeat" Cæsarean section, one should be prepared to meet with adhesions. The adhesions may involve the intestines, or a portion of the omentum and even the anterior abdominal wall. It is not desirable to attempt to separate all these adhesions at the time of the Cæsarean section, should they be extensive, as considerable delay may occur and the chances of uterine bleeding may be increased. A clear area on the uterine surface is selected or prepared for the incision, as near as possible to the median line, and the child and placenta delivered. After delivery of the foetus and placenta, and control of the uterine hæmorrhage, the adhesions may be separated as far as is consistent with the general condition of the patient.

During the puerperium, the usual treatment adopted for cases of laparotomy should be observed. The chief complications are: peritonitis, intestinal obstruction, and septic complications. Intestinal stasis or paralytic ileus is a troublesome complication, and is perhaps more frequent with cases of classical Cæsarean section, particularly if there is any slight degree of atony in the majority of cases, the obstruction is due to the pressure of the gut. Such distension should be treated by enemas, particularly turpentine enemata given every four hours, by bowel washes or

by injections of prostigmine and acetylcholine. Acute dilatation of the stomach may sometimes occur and requires gastric lavage.

LOWER SEGMENT CÆSAREAN SECTION

This operation has now come to be recognised as a valuable method of delivery, allowing a much larger number of cases to be delivered by the abdominal route than was possible a decade or two ago, when the classical Cæsarean section was the only operation available. The *advantages* of this method over the classical section are:—

(1) It is safer in cases where infection is suspected or where membranes have already ruptured.

(2) It can be done, and is in fact more easily performed, when the patient has been in labour for some time; whereas with the classical section the mortality increases with the number of hours the patient has been in labour.

(3) The after-treatment is much simpler and complications, such as vomiting, intestinal stasis and peritonitis, occur much more rarely than with the classical operation.

(4) It has been stated that the sutures can be more closely applied in the lower segment Cæsarean section and that the incised area is at rest during the puerperium, so that there is much less chance of escape of any lochial discharge through the wound into the general peritoneal cavity. Again, in the classical section, the alternative contractions and relaxations occurring in the upper uterine segment naturally put a strain on the sutures and do not allow the wound to heal so perfectly. Hence rupture of the uterus in subsequent labour is said to be more common after the classical operation, and rarer after a lower segment Cæsarean, where the healing of the incision is more perfect.

(5) The greatest advantage of a lower segment section is that it may be performed after the woman has had a "test labour," when the classical section is more risky.

As against these advantages, it may be stated that the lower segment Cæsarean section involves a more elaborate technique, and cannot therefore be performed by those not well experienced in the surgery of the abdomen. We must also state that we would not recommend this as an operation of choice in every case, as the undoubtedly the classical operation, if done at the time of election in suitable cases, does offer a more favourable prognosis to the patient.

Technique. The patient is prepared as for the classical operation; the bladder is emptied by a catheter and the patient placed in a moderate Trendelenburg position. The abdomen is opened by the mid-line by an incision which should extend from as near

symphysis pubis as possible, almost to the umbilicus. It is wise to carry the incision as low as possible, as then, the whole of the lower uterine segment can be properly exposed by retraction of the abdominal walls. The uterus is then exposed, and the surrounding area packed off with gauze wrung out in saline. The peritoneum on the anterior wall of the uterus, just above its reflection over the bladder, is then caught hold of loosely by a dissecting forceps, and a transverse incision made over the peritoneal investment at this level, extending from one side of the anterior uterine surface to the other. The upper flap of peritoneum thus divided is then separated by means of the finger covered with a piece of gauze and then lifted up whereas the peritoneum with the bladder in front is separated from the uterine wall and pushed as low down as possible. The peritoneum is reflected upwards as far as possible, up to the level of its firm attachment to the uterine wall. By thus reflecting the two flaps of the peritoneum above and below, the entire lower uterine segment and portion of the upper part of the



FIG. 200.—Lower segment Cæsarean: abdominal incision.

cervix become exposed. At this stage the uterus may be opened into, either by a curvilinear transverse incision or a vertical incision. Occasionally the vertical incision, if it is not sufficiently low for the delivery of the foetal head, may extend towards the fundus during the process of delivery of the foetus, and thus give rise to considerable hæmorrhage. After opening into the uterus, either by a vertical or transverse incision, the assistant can, by means of the hands, press the head of the foetus, if it be a cephalic presentation, through the

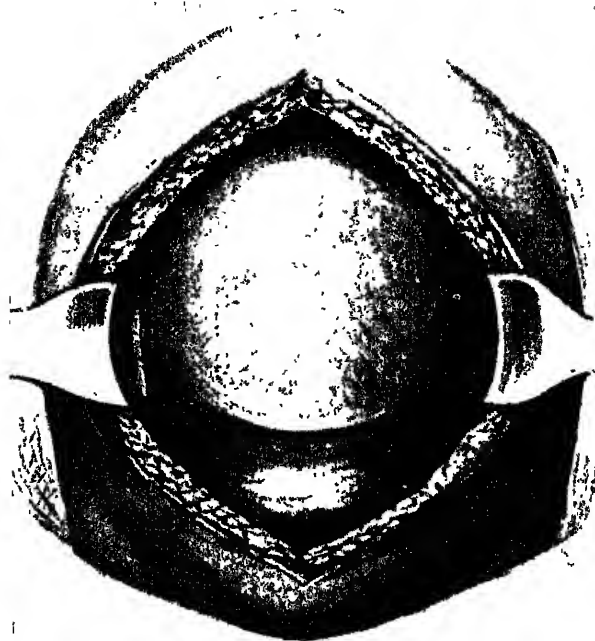


FIG. 201.—Lower segment Cæsarean. Uterus exposed and a transverse curved incision made just above the bladder.

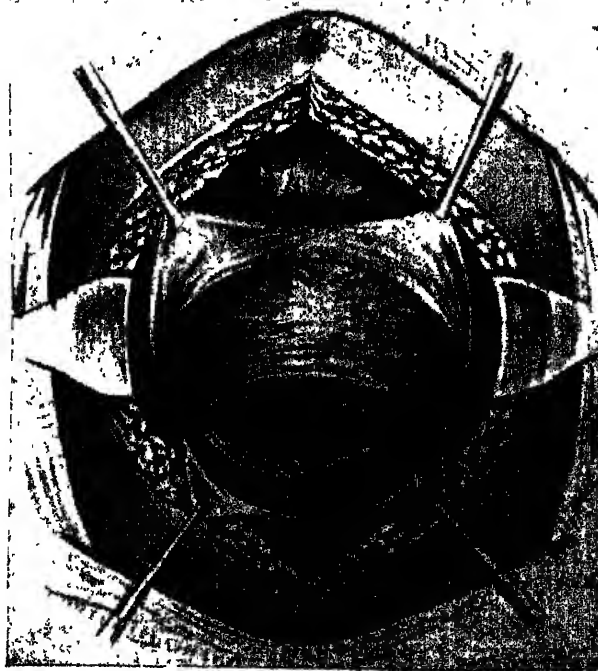


FIG. 202.—Lower segment Cæsarean. The lower segment incision exposing the scalp of the child.

uterine incision and the child can thus be delivered. In some cases the palm of the hand may be used to lever the head out, while the assistant helps with fundal pressure. Occasionally one blade of the forceps may be used for this purpose. The forceps may be applied and the head extracted through the uterine incision. We think that this step is unnecessary. The head can also be seized by Willett's forceps applied to the scalp and gently pulled through the opening. Care should be taken before delivery of the head, to see that the incision is sufficiently long to allow the head to be delivered without tearing the lateral ends of the wound in an irregular

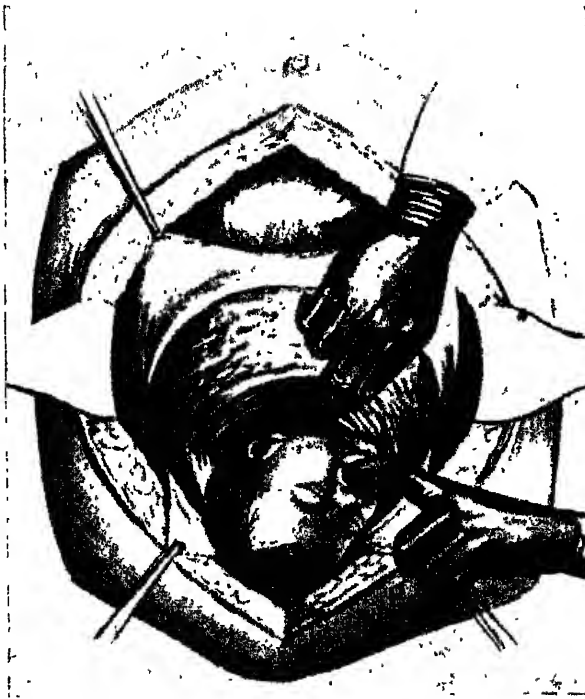


FIG. 203.—Lower segment Cæsarean. Delivery of the child through the incised opening.

manner. Once the head of the child has been delivered, the rest of the body follows with ease.

As soon as the child is delivered, an injection of pituitary extract is given; the placenta may then be expressed or removed manually and all clots carefully cleared out. Once the placenta has been expressed and the uterus is contracted, the incision is closed by continuous or interrupted catgut sutures, care being taken to see that the cut edges are approximated in order to control hæmorrhage as well as have correct apposition. In some cases, as an

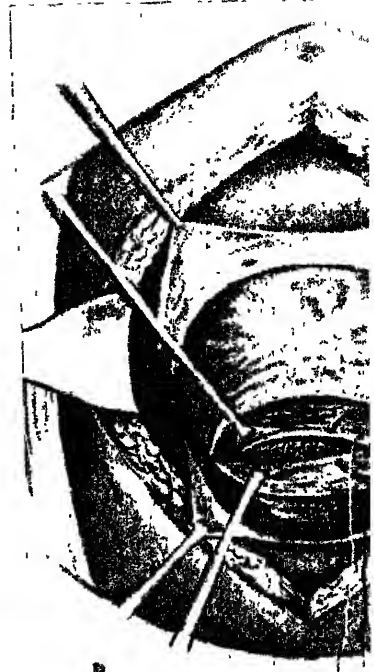


FIG. 204.—Lower segment Caesarean.
the lower segment inci



FIG. 205.—Lower segment Caesarean.
over the lower *

additional safeguard, a second row of sutures may be applied. The peritoneal flaps are then brought into apposition by continuous catgut suture. The abdominal wall is then closed in layers in the usual manner. In the absence of infection the convalescence in these cases is somewhat smoother than after the classical Cæsarean section.

Complications. (1) Injury to the bladder is particularly likely to occur if a vertical incision in the uterine wall extends low down.

(2) Irregular tears of the uterine wall may involve sometimes the uterine vessels, especially as the result of extension of a small transverse incision. The tear extends during the process of extraction of the foetal head. Care must be taken before extraction of the head to see that the incision is sufficiently long, and if there be any difficulty, the incision should first be extended before delivery of the head.

(3) Hæmorrhage is sometimes a very troublesome complication. Nothing unnerves the surgeon so much, as when the field of operation is not clearly in view; by careful technique this should be avoided.

EXTRAPERITONEAL CÆSAREAN SECTION

The object of this operation is to avoid opening into the peritoneal cavity, and it is therefore generally indicated in cases where there is an obvious risk of sepsis. The true extraperitoneal Cæsarean section is not an easy operation and involves a considerably more elaborate technique than the one needed either for a classical or lower segment Cæsarean section. It is an alternative to Cæsarean hysterectomy and should therefore be employed particularly in young mothers.

Technique. After the patient has been prepared in the usual manner and an anæsthetic given, the bladder is distended with a moderate quantity of fluid, so that it can easily be recognised, and the subsequent procedure of separating the peritoneal investment can be carried out under favourable conditions. The abdominal wall is incised by a median vertical incision down to the peritoneal investment. By blunt dissection the peritoneum is gently separated from the bladder; the bladder is emptied and pushed down as far as possible from the lower uterine segment. The uterovesical fold of peritoneum is pushed upwards by gauze dissection, great care being taken to see that it is not perforated. By passing the peritoneum upwards and the bladder downwards a space is created on the uterus, uncovered by peritoneum, is exposed. The lower uterine segment is then opened either by a vertical or a transverse incision and the head levered out by introducing a finger

into the mouth of the foetus. Care should be taken to see that in the delivery of the foetus the incision in the uterus does not extend irregularly, and if the opening be too small it is better to enlarge it by cutting through with a pair of scissors. Should the tear extend irregularly, there is risk of opening up the peritoneal cavity, or of the tear extending into the bladder. After delivery of the foetus the placenta can be easily expressed. An injection of pituitary extract followed by ergometrine may be given at this stage. The uterine incision is closed by interrupted sutures, the bladder is brought into position and fixed by two or three stay sutures to the reflected peritoneal investment, a gauze drain is put into one side of the incision and the abdomen closed in layers.

The after-care of the case is similar to that of a lower segment Cæsarean section.

RADICAL CÆSAREAN SECTION

(OR CÆSAREAN HYSTERECTOMY)

In this operation, after extraction of the foetus through the abdominal route, the uterus is removed. This may be done either by a total hysterectomy or by a supravaginal, i.e. subtotal hysterectomy.

Indications. The removal of the uterus in a woman of the child-bearing period should not be lightly undertaken, but occasionally it is necessary to perform an operation of this nature for the safety of the mother. The indications for Cæsarean hysterectomy are:—

(1) When a Cæsarean section is done because the uterus contains multiple fibroids where enucleation is not possible or attended with considerable risks.

(2) In all cases complicated by operable cancer of the cervix.

(3) In cases of inoperable cancer of the cervix, to prevent the risk of infection of the uterus from the fungating cervix after Cæsarean section.

(4) In some cases of rupture of the uterus as a result of obstructed labour.

(5) In some cases of concealed accidental hæmorrhage, where the uterine body is so diseased that it is impossible effectively to promote contraction and retraction and thereby control the bleeding.

(6) In some cases of severe atony of the uterus following a Cæsarean section.

(7) In cases where, in the interests of the child, the abdominal method of delivery is undertaken, where there is already evidence of uterine infection.

(8) In some cases of placenta prævia.

The question whether a supravaginal or a total hysterectomy should be undertaken will depend upon several factors. A total hysterectomy should be performed in the following conditions:—

(1) In septic infections of the uterus. In cases where infection is suspected, the cervix is a focus of such, and its removal thereby reduces the material risk of peritonitis or septicæmia.

(2) Rupture of the uterus.

(3) In cases where pregnancy is complicated by cancer of the cervix in an operable state.

Some would advocate a total hysterectomy in every case for the reason that it is not advisable to leave the cervical stump, which may at a later stage give rise to other complications, such as development of malignant growths. On the other hand, it should be realised that a total hysterectomy following Cæsarean section does involve a greater amount of shock to the patient, besides taking longer time to do the operation and also carrying a greater risk of hæmorrhage. It need not be undertaken as a matter of routine, and except under the circumstances already stated, where it is a necessary procedure, the question should be decided upon the general condition of the patient and the circumstances under which the operation has to be undertaken.

Technique. If a hysterectomy is decided upon, the child is generally delivered by a classical Cæsarean section. The cord is then clamped as close to the uterine opening as possible and severed, and a few deep sutures are inserted to close up the uterine opening. The uterus is then pulled up by grasping the fundus by a volsellum. A transverse incision is made over the peritoneal investment near its reflection from the bladder on to the anterior wall of the uterus, and the bladder gently separated and pushed down by gauze dissection. The broad ligaments are now double clamped, either medial to or lateral to the ovaries, depending on whether these are to be conserved or removed. The thickened round ligaments are also clamped each in two places. The broad ligaments and round ligaments are cut into between two clamps on either side up to the level of the cervix. The uterine artery on either side is double clamped, the points of the forceps being directed downwards and inwards so as to grasp a portion of the wall of the cervix. After cutting through between the forceps, the uterus is amputated at the level of the isthmus, taking care that the bladder is not in any way near the line of incision. The cut edges of the cervix, anteriorly and posteriorly, are caught by means of volsella while the uterine body is completely separated from the cervix. The cervix is lifted up by the two volsella, one on its anterior and the other on the posterior wall. Ligatures are then

applied to the portions of the broad ligaments already clamped, and the uterine arteries are tightly ligatured. The cervix is then closed by approximating the anterior and posterior lips by means of interrupted sutures, and the raw area peritonised by a continuous suture of catgut, bringing the loose flap of peritoneum lying anteriorly to the posterior layers of the broad ligaments and back of cervix.

Where a total hysterectomy is undertaken, after delivery of the foetus by Cæsarean section, the uterine wound is sutured; an incision is made just above the uterovesical pouch, and the peritoneum dissected below, so as to free the bladder completely from its cervical attachment. The broad ligaments are clamped as in a subtotal hysterectomy, but instead of cutting through the cervix, the amputation incision is made on the anterior and posterior vaginal fornix, and the cervix, with the uterine body completely removed by cutting through the vaginal walls all round the cervical attachment. The vagina is closed with a layer of interrupted catgut sutures, after the broad ligaments and the vessels have been tied with ligatures. Peritonisation of the raw area is carried out as in the supravaginal operation, and then the abdomen closed in layers.

PORTE'S OPERATION

This operation has recently come into vogue, and presents great possibilities under certain conditions, particularly in tropical countries, where neglected cases are more frequently met with.

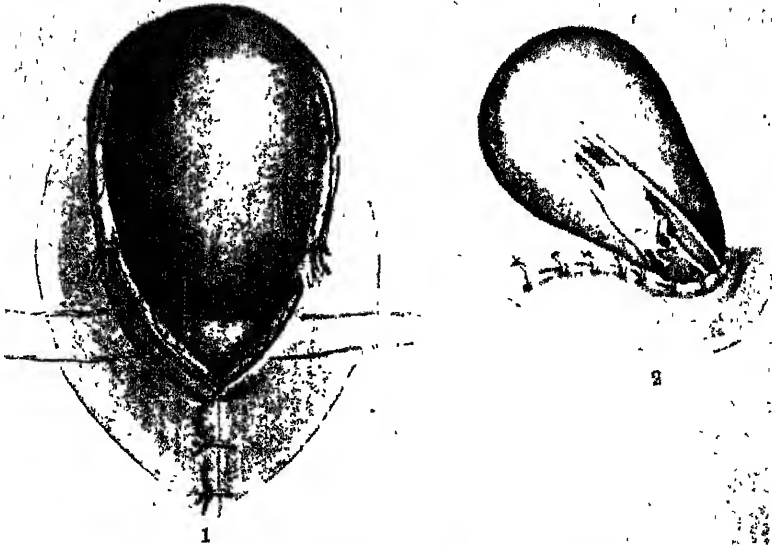


FIG. 206.—PORTE'S EXTERIORISATION OF THE UTERUS.

(1) The gravid uterus has been brought out of the abdominal cavity and the abdominal wall stitched around. (2) Anteroposterior and lateral view.

Technique. In this operation the unopened gravid uterus is delivered outside the abdominal cavity; the parietal peritoneum is closed behind, and stitched to the sides of the cervix and the abdominal wall sutured tightly. The uterus is then opened into, the foetus delivered and the placenta removed. The uterine incision is closed with interrupted sutures, and the uterus, protected with sterile dressings, is allowed to involute outside the abdominal cavity. After a few weeks, when the woman has recovered from the effects of the operation, and the signs of sepsis have abated, the abdomen is reopened, the uterus is replaced, and the abdomen closed in layers. We have had a case however, where the necessity for reopening the abdomen and replacing the uterus did not arise. The uterus retracted after involution and the abdominal wall closed over the fundal area.

The operation possesses the advantage that risks of infection of the peritoneal cavity are reduced to a minimum and the uterus is saved. Cases have been reported where a subsequent pregnancy has occurred. This operation has not been extensively performed, but presents an attractive alternative to Cæsarean hysterectomy.

POST-MORTEM CÆSAREAN SECTION

Sometimes the foetus lives for a few minutes after the death of the mother, and it is quite possible to save the life of the child if an immediate Cæsarean section is done. Where either religious beliefs or customs of the land necessitate the delivery of the foetus before disposal of the dead body of the mother, it is a question whether greater advantage should not be taken of immediate post-mortem Cæsarean section. The difficulty is to be certain that the mother is dead, and the practitioner must guard himself against the criticism that the operation has hastened the death of the patient. In a few cases children have been saved by such an operation.

REPEAT CÆSAREAN

The widely prevalent maxim that "Once a Cæsarean section, always a Cæsarean section," has been proved to be not quite accurate. We have had several cases, and many more have been recorded in the literature, where a woman has been able to deliver through the natural passages a live, full-term child after a previous Cæsarean section. This is to be expected when a Cæsarean section has been performed for indications other than contraction of the pelvis or obstruction to the genital passages from other causes. Where no contraindications exist, it has been our practice to leave a case of previous Cæsarean section to deliver *per vaginam*,

provided a hospital delivery is arranged for, so that the patient can be carefully watched throughout labour and any emergency dealt with in a properly equipped theatre. In such cases no ecbolics such as pituitary extract ought to be given, and it is well to terminate the second stage of labour as soon as possible by the application of forceps, or by extraction of the foetus, if the breech is presenting, as thereby excessive strain on the uterine scar is avoided. We have already referred to the possibilities of rupture of a Cæsarean scar, but we hold that with a proper and careful technique in the suturing of the uterine incision at the section, this should be an exceedingly rare complication, provided there has been no sepsis during the puerperium which would interfere with the healing up of the wound. In some cases, however, a repeat Cæsarean section is inevitable, as the same indication that necessitated the former Cæsarean is present in the subsequent pregnancy, e.g. disproportion.

The number of times a Cæsarean section can be safely performed on one woman depends upon several factors; cases have been recorded where Cæsarean section has been performed seven times. We have done as many as four on the same woman, but we are inclined to the view that Cæsarean section repeated so frequently puts a heavy mental and physical strain on the patient; if the previous children are alive, we prefer to sterilise a patient after three sections.

Whether a Cæsarean section can be safely repeated at a future pregnancy, and how often this can be done, depends to a large extent upon the degree of adhesions present and the nature of the uterine musculature as judged at the previous Cæsarean section. A fact of much importance, because of the possibility of having to perform a repeat Cæsarean section, is to see that after the uterus has been sutured, it is left in the abdominal cavity with no omentum lying in front of the sutured wound.

STERILISATION AT CÆSAREAN SECTION

This procedure should not be lightly undertaken. In most cases it is undesirable to sterilise a woman after one pregnancy. The uncertainties of life connected with the new-born child and the problems created by the psychology of the "only child" must be a sufficient warning to the obstetrician not to yield easily to the patient's request to sterilise her after her first child has arrived. With modern technique the dangers of a repeat Cæsarean section should be little. At the same time, as we have already stated, it is necessary to realise that we are dealing with human temperaments and human emotions, and in subsequent Cæsarean sections

we are inclined to leave it to the patient to decide after the case has been fully presented to her, whether sterilisation should be effected or not.

Where sterilisation is indicated or demanded, the method employed should be such as to leave no possibilities of a subsequent pregnancy occurring. Mere ligature of the tubes or even resection of a portion of the tube is not absolutely certain. The best method is to remove the whole Fallopian tube, including the interstitial portion by excising the uterine cornu. Invaginate the stump of the broad ligament and close up the uterus by means of sutures.

We do not recommend sterilisation by a supravaginal or total hysterectomy. The onset of the artificial menopause and the absence of the uterus probably play an important factor in the sexual life of the woman and are points for consideration before hysterectomy is undertaken. Moreover, a hysterectomy is an unnecessary procedure purely for purposes of sterilisation.

PROGNOSIS

With improved technique, the prognosis after Cæsarean section should be very much more favourable now than it was twenty or thirty years ago. It is unfortunate, however, that when a large series of cases are reviewed the mortality rate is still found to be high. This is due to two factors: an incorrect appreciation of the indications for this operation, and an unfortunate tendency to resort to this procedure when all other methods of delivery have failed. A factor which greatly influences the prognosis is the time at which the operation is undertaken. It has been shown by Eardley Holland, in an exceedingly valuable analysis of nearly 2000 cases of Cæsarean section performed in some of the British hospitals, that the prognosis is most favourable when the operation is done either before labour or early in labour. The later the operation is performed, the graver becomes the maternal risks, and the worst prognosis is in those cases where Cæsarean section is done after unsuccessful attempts at delivery by other methods.

The prognosis is also influenced by septic complications. While the lower segment Cæsarean section has certainly improved the prognosis in some of these conditions, it should be clearly realised that there is still a risk though that risk has been shown to be less than after the classical operation.

In cases where Cæsarean section is necessitated for conditions like placenta prævia and accidental hæmorrhage, the prognosis will depend upon the general condition of the patient at the time of the operation, and where the patient has been very much devitalised by the loss of blood, the prognosis is grave.

The radical section must inevitably give a worse prognosis, for the obvious reason that it is adopted in patients with complications and in a worse state of health; but it should also be realised that in these cases the alternative method of treatment by the vaginal route would give a somewhat higher percentage of mortality.

The presence or absence of other complications in the mother are also material factors in influencing the prognosis. One cannot help remarking that the furore for a Cæsarean section must be checked if an unnecessary increase in maternal mortality is to be avoided.

The subsequent rupture of a previous Cæsarean section scar has been much discussed. It has been stated that this possibility is greater after classical Cæsarean section than after a lower segment operation. Much depends upon the method of suturing adopted. That the lower segment Cæsarean scar need not necessarily be more resistant is obvious from the observations of DeLee, Nadelhoffer and Greenhay, who state that in several cases of laparo-trachelotomy they found the old incision just on the point of rupture. It is for this reason the dictum—"Once a Cæsarean, always a Cæsarean," has come to be generally accepted. But this is not necessarily so, and in several cases we have had successful natural deliveries following a previous Cæsarean section where the section was performed for conditions other than for an absolute indication due to pelvic contraction.

A point to be considered in this connection is the occurrence of sepsis during the healing of the Cæsarean scar. This undoubtedly interferes with proper healing of the uterine incision and leads to weakness of the scar.

The prognosis in cases of repeat Cæsarean sections depends very much upon the presence or absence of adhesions consequent upon the previous operation. Many adhesions increase the technical difficulties of the operation and during their separation injury to bowel may result. Repeat Cæsarean sections are generally necessitated where the operation has been resorted to in cases of definite pelvic contraction.

VAGINAL CÆSAREAN SECTION

This is an operation by which delivery is effected after opening into the uterus through the vaginal route.

Indications. The operation is sometimes indicated during labour when immediate delivery is called for, or where a rigid cervix does not permit of easy dilatation.

Under the first indication come such conditions as :—

- (1) Placenta prævia.
- (2) Abruption placentæ.
- (3) Certain cases of eclampsia.
- (4) Hyperemesis gravidarum.
- (5) In patients with diseases of the heart or lungs.
- (6) Some cases of prolapse of the cord, if the cord is pulsating.

Under the second indication, when the operation is done to overcome certain conditions of the soft parts causing obstruction to delivery, may be mentioned :—

- (1) Organic rigidity of the cervix, developmental in origin or the result of cicatrization from previous operations.
- (2) Sacculation of the uterus, anterior or posterior.
- (3) Certain cases of prolapse of the gravid uterus.

Conditions. (1) Certain conditions should be satisfied before a vaginal Cæsarean section is thought of. The most important of these is that the pelvis be normal. It should never be done in cases complicated by a contraction of the bony pelvis. The operation

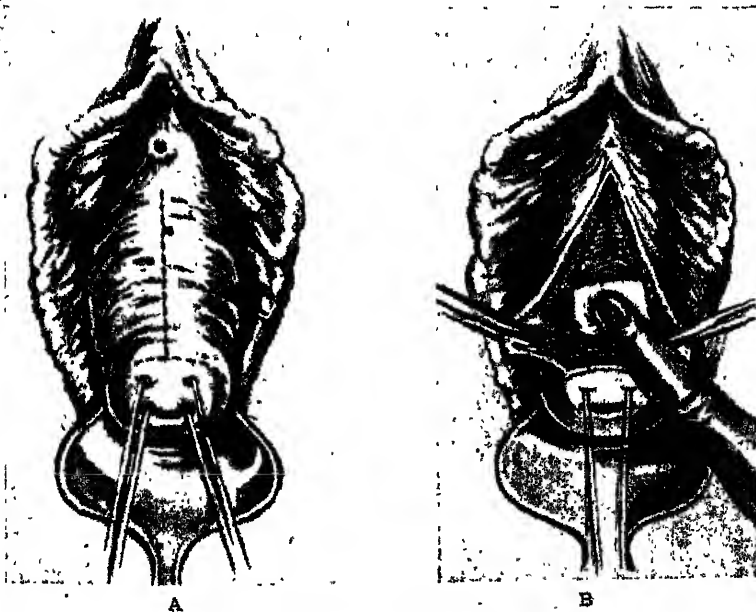


FIG. 207.—Vaginal Cæsarean section.

- A. Inverted T-shaped incision.
- B. Dissecting-out the flaps and separating the bladder.

can therefore be done only where it is possible to deliver the foetus by the vaginal route without any increased risk to the foetus.

(2) If the operation is not done solely in the interests of the mother, the child should be alive.

(3) The soft tissues should not be sodden or œdematous.

The *advantages* of a vaginal Cæsarean section over other methods are :—

- (a) In suitable cases it affords a rapid method of delivery, unattended with much shock ;
- (b) In cases where septic complications are present it is much better to deliver by the vaginal route than by the abdominal route.
- (c) In cases of atresia of the cervix, it is a very suitable operation, as it does not expose the woman to the risks incidental to an abdominal section, and the subsequent convalescence is more rapid.

Technique. After preliminary preparations the patient is placed in the lithotomy position and the vulva and vagina thoroughly cleaned. It is necessary in some cases to make a paravaginal incision on one or both sides. This gives a good exposure of the whole field of operation, and is an essential step when the operation is done to effect delivery of a full-term foetus. A weighted posterior vaginal speculum is introduced and the cervix seized by two sponge-holding forceps and drawn as low down as possible. A transverse incision is made over the anterior surface of the cervix, just below the reflexion of the bladder, and a longitudinal incision is also made in the anterior vaginal wall extending from just below the urethra to meet the transverse incision. By blunt dissection with sterile gauze, the bladder wall, now exposed, is pushed up as high as possible, both mesially and laterally. This is an important step in the operation, as otherwise in the further course of delivery the bladder is likely to be injured. The anterior cervical wall is now completely exposed, as well as the lower uterine segment, and with a pair of scissors, the anterior lip of the cervix and the lower uterine segment are divided in the middle line. This immediately lays open the uterine cavity, and the membranes bulge down. The incision should be sufficiently long—at least $3\frac{1}{2}$ to 4 inches—to allow the subsequent manipulations for delivery to be easily made. The hand is now introduced into the uterus, the membranes ruptured, a foot of the child seized and delivery performed by version and extraction. The placenta is then expressed, the cervical incision is sutured by interrupted catgut sutures, after which the bladder is replaced and the vaginal mucous membrane brought into position and stitched by interrupted or continuous suture.

sutures. The uterus is controlled and retraction and contraction promoted by injection of pituitary extract and ergometrine, or other suitable echolics. In some cases, however, particularly if the section is done at term, with a well-developed foetus, the

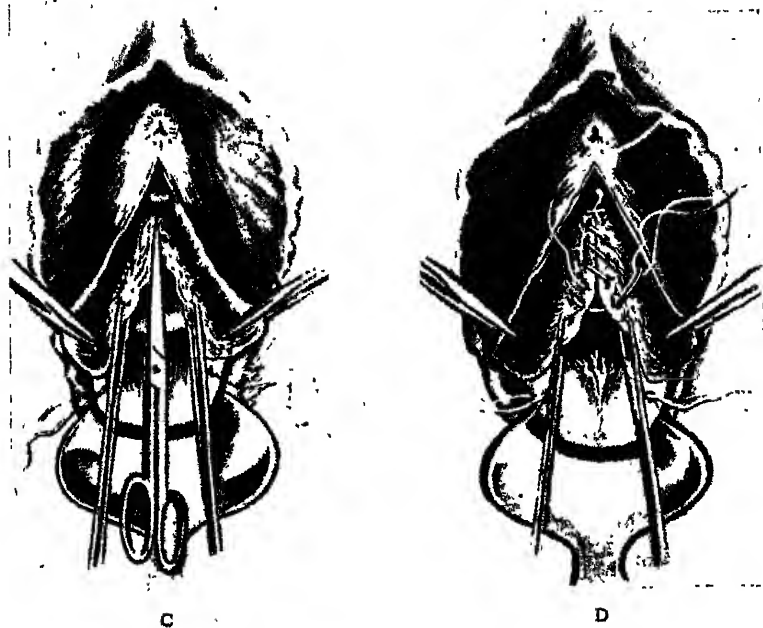


FIG. 208.—Vaginal Caesarean section.

C. Incision on the cervix and lower uterine segment.

D. The suturing up of the cervix and lower uterine segment after delivery.

anterior incision is not sufficient to permit of easy delivery. Under such circumstances an incision is made in the posterior lip of the cervix as well. The posterior vaginal vault is incised transversely, and the peritoneum of the pouch of Douglas defined, separated, and pushed up, thus exposing the posterior wall of the cervix and the lower uterine segment. The posterior lip of the cervix is then incised in the middle line. With the anterior and posterior walls thus opened out, dilatation is sufficient to effect the delivery of the full-time foetus. The posterior incision should be treated in a similar manner to that of the anterior, after the placenta has been expressed.

Vaginal hysterotomy offers great advantages in certain cases, as a clean incision is made, a perfect repair can be done, and hæmorrhage controlled, while the peritoneal cavity is not opened

to. Difficulties may, however, be experienced if the incisions be too short or deviate from the mid-line, and profuse hæmorrhage may occur if irregular lacerations develop during the course of the delivery, because of small incisions having been made before. The paravaginal incision should be repaired in the usual manner.

If vaginal hysterotomy is performed before the sixth month, it is hardly necessary to make a paravaginal incision; and then an anterior incision of the cervical canal and the lower uterine segment is sufficient for purposes of delivery. In fact, if the pregnancy is advanced to more than sixteen weeks, this method of delivery affords great advantages over the alternative method of vaginal delivery by manual dilatation of the cervical canal.

Future pregnancies and labours need not be complicated, and many cases have been reported where, after a vaginal Cæsarean section, subsequent child-birth has been normal. In cases where the incised wounds do not heal completely, particularly the cervix, erosions and a certain amount of sclerosis may result.

A modified form of vaginal hysterotomy can also be utilised in those cases where a hard rigid cervix does not yield during the course of labour, and where it is necessary to deliver the child urgently on account of foetal distress. The alternative to a vaginal Cæsarean section is to incise the cervical canal and then dilate it before delivery is effected. Incisions into the cervix for this purpose must be made at different places, so that, should the incised wound extend in the process of delivery, two dangers may be avoided—injury to the uterine vessels or the bladder, and opening up of the peritoneal pouch or the pelvic cellular tissue. This is best done by making a triradiate incision of the cervix, the incisions being generally done in a longitudinal direction at 10, 2 and 6 of the clock, with reference to the cervical orifice. After delivery, in such cases, the margins of the wound should be accurately brought into apposition with catgut sutures. The cervix should then be painted with some antiseptic such as brilliant green, mercurochrome, tincture of benzoin, etc.

CHAPTER XLIX

ENLARGEMENT OF THE PELVIC CAVITY

WE have described the methods of delivery by the abdominal route where there is a definite disproportion between the maternal pelvis and the foetal head, so that it would be impossible to

living foetus to pass through the particular pelvis. In suitable cases of relative disproportion it is possible for the head to come through, provided the true pelvis is slightly enlarged, the enlargement being needed sometimes at the brim, sometimes at the outlet and sometimes throughout the cavity.



FIG. 209.—Walcher's position.

There are two methods by which enlargement of the pelvic canal can be obtained:—

- (1) Postural methods, and
- (2) Operative methods.

Postural Methods. Reference has been made in previous chapters to the possibility of increasing the dimensions of the pelvis in certain of its planes by placing the patient in a suitable posture. The two chief ones recognised for this purpose are Walcher's position and the exaggerated lithotomy position.

Walcher's position enlarges the conjugate vera, while the exaggerated lithotomy position increases the diameters of the bony outlet, particularly the anteroposterior diameter. The details regarding these postures, and the indications for their use, have been dealt with in the chapter on contracted pelvis.

Operative Methods of enlarging the Pelvic Cavity. The two well-recognised methods of enlarging the pelvic cavity are the operations of symphysiotomy and pubiotomy or hebosteotomy.

Symphysiotomy

This operation, which was first performed in 1777, has had a very chequered career, being alternately condemned and praised as a suitable method of treatment for enlarging the pelvis and delivering the child in certain cases of relative disproportion. On the whole, there is very little support given to an operation of this description at present. The complications that are likely to occur during the course of the operation, the possibilities of damage to the urethra and the bladder, and the hæmorrhage that may occasionally be very troublesome to control if some of the veins are injured, and the relatively weak pelvic girdle that is likely to result thereafter, are some of the objections to the performance of this operation.

Pubiotomy, on the other hand, is a safer operation, provided care is taken in the selection of the cases. The chances of injury to the bladder and the urethra are much less, and the union is more firm than in cases of symphysiotomy.

Indications. The indications for either of these operations are :—

(1) Moderate degrees of contraction of the pelvic inlet or of the pelvic outlet.

(2) Relative disproportion of the head to the pelvis because of an unduly ossified or large postmature head.

(3) Unfavourable positions of the head, particularly occipito-posterior positions.

Pubiotomy or symphysiotomy is not to be adopted unless the obstetrician feels perfectly sure that after such an operation the relative disproportion will be overcome and that the head can be born fairly easily through the enlarged pelvis. Secondly, the degree of enlargement should be strictly controlled, so as to prevent subluxation of the joints or flaring out of the iliac bones. It must be clearly realised, therefore, that the enlargement of the pelvic diameters is permissible strictly within certain limits. The cut ends should not be allowed

to separate more than 6 mm. This is reckoned to give an increase of 1 cm. in the conjugate of the brim, 1.5 cm. in the oblique diameter and 2 cm. in the transverse diameter.

Necessary Conditions for performing Symphysiotomy or Pubiotomy. There are certain conditions which must be fulfilled before either of these operations is undertaken:—

- (1) The child must be alive.
- (2) It should be a cephalic presentation; but it is inadvisable to perform the operation in cases of brow presentation or persistent mento-posterior positions.
- (3) The cervix should be fully dilated.
- (4) The pelvis must not be very much contracted, and the extent of the disproportion between the foetal head and the pelvis should be moderate, so that the slight increase in the pelvic diameter will allow the head to pass through easily.
- (5) The parturient canal should not be infected.
- (6) The membranes should have ruptured.
- (7) Lastly, an attempt at forceps delivery should have preceded an operation of this nature.

The last condition requires an explanation. It is within the experience of most obstetricians that occasionally one meets with cases which appear as if they would present considerable difficulty at delivery, but when forceps traction is applied the head comes through easily. We do not consider it desirable that pubiotomy should be performed before traction has been attempted with forceps; but of course only moderate force should have been used at such an attempt. Besides the fact that the child may be delivered in this way, there is the additional advantage that it helps the obstetrician to a clearer realisation of the extent of the disproportion, and the possibilities of the head coming through after enlargement of the pelvic cavity by either of these operations. Each necessary condition is dealt with in detail.

(1) *The Child must be alive.* This is an important and obvious condition before undertaking an operation of this nature. There is absolutely no justification for submitting a woman to the risks of pubiotomy or symphysiotomy when the child is dead, or when its condition is such that the chances of its being born alive, or continuing to live after birth are small. If, therefore, in a case of prolonged labour it is found that the condition of the child is such that its vitality is already very much impaired, the risks of the operation for the mother are such that, if forceps fail, a caesareanotomy should be carried out.

(2) *The Child must present by the Cephalic Pole.* This condition is necessary because it is only in such cases that the obste-

trician can correctly judge whether the enlargement of the pelvis after symphysiotomy or pubiotomy will be sufficient to permit of the subsequent delivery of the foetal head. It is impossible to arrive at such a conclusion in breech deliveries. It is not, however, the most suitable method of treatment for cases of brow presentation or in mento-posterior cases. In either of these cases, if the presentation cannot be corrected, the possibilities are that if after pubiotomy the head is pulled through as brow or a mento-posterior, the longest diameter that has to come through would put such a strain upon the relaxed pelvis that a much further amount of stretching would be necessary than is safe.

A suggestion has been made that in some cases pubiotomy may be performed to aid delivery of the after-coming head. For this reason the pubiotomy needle must be passed and a Gigli wire kept in position and readiness, so that a pubiotomy may be done promptly whenever difficulty is experienced in the delivery of the after-coming head. In practice, however, this is not feasible, and in the hurry and excitement of delivering the after-coming head there is risk of increasing the pelvic capacity to a dangerous extent.

(3) *Degree of Contraction of the Pelvis.* As has already been emphasised, these operations are to be performed within certain limits of pelvic disproportion. The most important point to note is the relative disproportion between the cephalic pole and the pelvis, and neither of these operations should be performed if the disproportion is at all great. It is difficult to lay down with any certainty the dimensions or the particular limits of the pelvic diameters which may permit of a symphysiotomy or a pubiotomy. Such a decision can be arrived at only when the woman has been in labour for some time and the obstetrician has had an opportunity of appreciating the extent to which the cephalic pole overlaps. For this reason we are frankly opposed to what has been termed prophylactic pubiotomy—an operation which it is suggested should be performed a few weeks before the woman actually goes into labour. We have already stated that not only should these operations be done after the woman has been in labour for some time, but after an attempt at delivery with forceps. It is only by adopting such precautions that one will avoid the unnecessary employment of these operations.

(4) *The Cervix should be fully dilated.* This necessarily follows from what has been stated above. There is no object in submitting a woman to symphysiotomy or pubiotomy unless the conditions are favourable for an immediate forceps delivery; and, moreover, if an attempt at forceps is to precede this operation it is obvious that the conditions necessary for the application of

forceps should have been available, one of the chief of which is that the cervical canal be fully dilated.

(5) *The Birth Canal should not be infected.* This is an important factor to be taken into account. Whatever may be the precautions taken, both in pubiotomy and symphysiotomy, a certain amount of pelvic cellular tissue is opened up, and the possibilities of spread of infection are accordingly great and maternal risks considerably increased. If there is obvious sepsis, or the woman has been frequently examined and repeated attempts made at delivery, the case is most unsuitable for pubiotomy or symphysiotomy.

Technique. Having satisfied oneself that the necessary indications and conditions are present for the performance of this operation, the patient is anæsthetised after the parts have been shaved and thoroughly cleansed. She is brought to the edge of the bed and the legs supported by assistants as for a forceps delivery. The area of the operation is painted with suitable antiseptic and draped with sterilised sheets.

There are two methods by which the operation can be performed. One is called the subcutaneous method and the other the open method. The open method has been given up in view of the increased risks of septic infection. In the subcutaneous method the skin of the anterior abdominal wall, an inch and a half above the symphysis pubis, is drawn down so as to lie over the symphysis. A small transverse incision is made about half an inch in length and the blade of the knife passed through this incised, wound, its flat surface being closely applied to the anterior surface of the symphysis. The knife is then turned at right angles and with the cutting edge, the symphysis pubis is gradually cut through. With a finger inserted in the vagina this can be controlled so that only the joint and the sub-pubic ligament are divided. Before final separation of the symphysis pubis, care must be taken to see that the assistant on either side holds the hip pressed inwards, thereby preventing sudden flaring out of the iliac bones as the two pelvic bones spring apart. After division of the symphysis pubis, the knife is removed and the child extracted by forceps.

A great deal of controversy has arisen as to whether at this stage it is desirable to leave labour to natural efforts; but in view of what we have said already—that an attempt at forceps extraction should always precede this operation, and only where this just fails to effect the delivery should symphysiotomy be performed—we hold that the forceps should be *in situ* before symphysiotomy is performed. It therefore follows that as soon as symphysiotomy has been performed the child is delivered by

extraction by the forceps that has already been applied. Care should be taken during delivery to exert as little force as possible. Any attempt at rapid delivery will cause a sudden increase of the extent to which the symphysis pubis is separated.

After the symphysiotomy has been performed and the blade of the knife removed it will be found that the point of puncture of the knife is much above the symphysis pubis, and so possibilities of septic infection are lessened. The incision can be closed by a single suture of silkworm gut and dressed.

When the delivery has been completed and the placenta expressed, the pelvis must be firmly strapped with a long strip of plaster about three inches wide, passing round the pelvis at the level of the femoral trochanters. The patient should be kept on a firm bed with fracture boards under the mattress and treated much on the same lines as a fracture of the pelvis, being allowed to move about only after two weeks.

The after-care of the patient needs much careful attention.

The dangers of symphysiotomy are :—

- (1) Severe hæmorrhage from laceration of the structures behind the symphysis pubis, especially when these involve the veins of the space of Retzius.
- (2) Injuries to the urethra and bladder.
- (3) Injury to the sacro-iliac joints, leading later to a permanent defect in locomotion.
- (4) Infection of the wound.

Such injuries are more likely to result when the case is not suitably selected and the operation done when the head is relatively too big to come through easily after the pelvic diameters have been enlarged.

Excessive separation of the symphysis, to allow of the foetal head to come through, stretches the soft parts, separates them and leads to irregular tears which may involve the soft structures, especially the bladder and the urethra. In such cases, apart from the shock, the hæmorrhage is severe and the chances of septic infection are considerably increased. For this reason it is necessary that the assistants should understand the extent to which the pelvis must be supported after the symphysiotomy and during delivery of the head.

Most obstetricians prefer the much safer operation of perineotomy when there is a necessity for delivery of the foetus through the natural passages in minor degrees of contracted pelvis or relative disproportion.

Pubiotomy

The indications for this operation, as well as the conditions that should be satisfied before it can be undertaken, have been dealt with under symphysiotomy.

Pubiotomy has certain advantages over symphysiotomy, and is therefore preferred when enlargement of the pelvic cavity is considered for effecting delivery in border-line cases of disproportion. These advantages are:—

(1) There is less risk of injury to the bladder and the urethra.

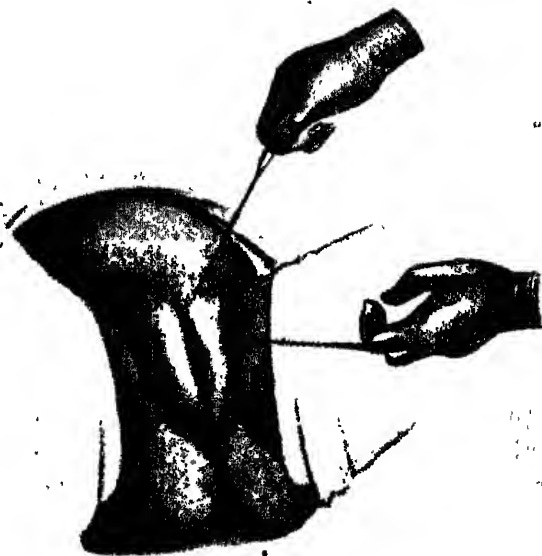


FIG. 210.—Pubiotomy. Gigli's saw *in situ*.

(2) The hæmorrhage is much less than in symphysiotomy, because the bone is cut through further away from the median line and the veins in the space of Retzius are avoided.

(3) The subsequent union is more firm and therefore a more stable pelvic girdle results.

(4) A permanent enlargement of the pelvic canal is obtained.

Technique. There are two methods of performing pubiotomy, the open method and the subcutaneous method. The open method has been largely given up now in view of the risk of septic infection. In the subcutaneous method, after the patient has been prepared in the usual manner and anaesthetised, she is placed in the lithotomy position in the posture already adopted for the previously attempted forceps delivery. Two assistants, one on either side support the lower extremities; a small transverse incision

about an inch long is made, generally over the left pubic tubercle, down to the periosteum. A finger is then passed through this incision and the adjacent tissues are separated from the bone. A Doderline's pubiotomy needle is now passed through the incised opening closely hugging the posterior aspect of the pubic bone, till the tip of the needle passes below the inferior margin of the bone. It is then manipulated so that the tip is felt lying deep to the upper and outer part of the labium majus. After making a small skin incision over the point of the needle it is made to protrude. Gigli's wire saw is then attached to the hook on the end of this and the needle withdrawn, so that the saw is brought out through the upper incision. Handles are then fixed to either end of the saw and the pubic bone is sawn through, care being taken to see that the whole of the bone is sawn through in the proper direction. At this stage the assistants must press the thighs inwards sufficiently to prevent undue separation of the divided pubic bone. After pubiotomy has been completed labour should be terminated by the forceps.

After delivery the upper wound may be closed with one or two sutures and sterile dressings are then applied over both the upper wound and that over the labium majus. The pelvis is immobilised by strapping with adhesive plaster and the patient kept at rest on a fairly hard and unyielding mattress.

The after-care is similar to that in any ordinary puerperium.

Prognosis. Pubiotomy not only allows delivery of the foetus at the time but increases the dimensions of the pelvis permanently, so that at subsequent labours the child may be born *per via naturalis* more easily. The immediate risks of the operation have already been dealt with. If suitable cases are selected and the technique carefully followed the prognosis should be favourable. Misjudgment as to the relative degree of disproportion, injury to some of the important structures and sepsis militate against a successful outcome.

CHAPTER L

INDUCTION OF ABORTION AND LABOUR

UNDER certain circumstances it is necessary to induce abortion or labour.

Induction of Abortion

This term should, strictly speaking, be applied to the artificial interruption of pregnancy and evacuation of the uterus performed within the first twelve weeks of pregnancy or before the full ter-

mation of the placenta; but in practice it is extended to include evacuation of the uterus before the twenty-eighth week of pregnancy; in other words, before the foetus is viable.

Indications. The indications for this operation must be clearly defined, and it is advisable in every case where abortion is to be induced that the practitioner protects himself from the charge of unjustifiable interference by conscientiously considering all the factors indicating the necessity for induction, as well as by obtaining a second and independent medical opinion in writing. With a clearer realisation of the possibilities of conservative treatment, to enable pregnancy to continue, the indications for induction of abortion are becoming more and more limited. Obviously this is an operation which is performed in the interests of the mother, when conditions are present which will lead inevitably to a fatal issue or to serious impairment of her health, if pregnancy be allowed to continue.

The main indications are:—

(1) To save the mother from the immediate risk of a serious complication of pregnancy.

(2) To prevent serious risk to life or health if pregnancy continues.

(3) To prevent the possibility of certain complications supervening should pregnancy continue.

(1) *To save the Mother from Imminent Risks.*

(a) In cases of hyperemesis gravidarum. This is a serious complication which occasionally can only be controlled by evacuation of the uterus. Care must be taken to see that the patient is not in *extremis* before such an operation is undertaken.

(b) In some cases of incarceration of the retroverted gravid uterus.

(c) Acute yellow atrophy.

(2) *To prevent Unnecessary Risk to the Mother.* The following conditions may be mentioned under this group:—

(a) Pre-eclamptic toxæmia.

(b) Diseases of the heart, if decompensation has occurred at some time.

(c) Certain cases of tuberculosis of the lungs.

(d) Chorea gravidarum.

(e) Hydatidiform mole.

(f) Certain general diseases which may seriously impair the health of the mother, such as nephritis, leukæ-

mias, exophthalmic goitre, certain nervous diseases, etc.

(g) Intractable pyelitis.

(3) Under the third heading may be mentioned such conditions as tumours complicating pregnancy, malignant disease of the cervix, etc.

METHODS OF INDUCING ABORTION

Certain considerations must be borne in mind in the choice of the method of inducing abortion.

(1) The Duration of Pregnancy. Within the first twelve weeks of pregnancy it is possible to induce abortion and complete the evacuation at one sitting by operative methods through the vaginal route. After the twelfth week, on the other hand, this procedure becomes increasingly difficult, and after the sixteenth week it is neither possible nor desirable to attempt to complete the evacuation at one sitting. Under such circumstances, if the evacuation is urgent, a different method has to be followed.

(2) The method also depends upon the urgency of the case. As has been pointed out, rapid methods of evacuation are not possible if pregnancy has progressed beyond the twelfth or fourteenth week.

(3) In certain circumstances as in primiparæ and also when a hard rigid cervix is met with, the method of inducing abortion may be different from that ordinarily followed in a multipara and with soft yielding cervix.

We shall now proceed with the different methods of inducing abortion;—

(1) Dilatation of the cervical canal with evacuation of the uterus by the finger or the curette.

(2) Gradual dilatation of the cervical canal by the use of laminaria tents.

(3) Dilatation of the cervical canal by plugging of the canal and the vagina with gauze.

(4) Vaginal hysterotomy.

(5) Abdominal hysterotomy.

(6) The use of Roentgen rays.

(1) **Dilatation of the Cervical Canal, with Evacuation of the Uterus by the Finger or the Curette.** This method of evacuation may be adopted before the twelfth week of pregnancy in suitable cases. The patient is anaesthetised and prepared with all due aseptic and antiseptic precautions; the cervix is dilated by Hegar's or Matthews Duncan's dilators sufficiently to admit the finger

freely. The index finger is then introduced through the cervical canal, and the ovum is gently separated from the uterus. After separation of the ovum, an ovum forceps is passed into the uterus, the ovum grasped and removed by gentle twisting and traction. The ordinary ovum forceps is, however, often too big to be introduced with the dilatation that has been effected, and we have found the ordinary sponge forceps quite as effective to grasp and remove the ovum. After this has been removed a blunt flushing curette may be introduced into the uterus and the uterus gently curetted and flushed out. It is always necessary to verify, by passing the finger again into the uterine cavity, if all the products of conception have been completely removed. This precaution is advisable, as not infrequently the use of the curette leaves behind bits of placenta which keep up bleeding and later decompose and give rise to sepsis.

(2) **Gradual Dilatation of the Cervical Canal by Laminaria Tents.** In this method the cervix is dilated up to No. 12 size of Matthews Duncan's dilator, and one or two laminaria tents, properly sterilised, are introduced into the cervical canal, so that their tips lie beyond the internal os, and left *in situ* for twelve to twenty-four hours. The cervix is gradually dilated as the tents swell by absorbing moisture, uterine contractions are provoked, and at the end of the period, the tents are removed and the uterus evacuated in the manner already described above, as after twenty-four hours cervical dilatation permits the introduction of one finger.

The disadvantage in this method, however, is that it is not always possible to avoid sepsis. We ourselves do not advocate the use of laminaria tents for the induction of abortion.

(3) **Vaginal Hysterotomy.** This is a method of evacuation which is rapid and certain. In cases where it is not possible to dilate the cervix sufficiently to complete the evacuation at one sitting, vaginal hysterotomy is indicated. Such cases include primiparæ with hard rigid cervix, diseased conditions of the mother when it is not desirable to prolong the period within which evacuation can be completed, and in cases where pregnancy has advanced beyond the fourteenth week.

This operation is done in much the same manner as a vaginal Cæsarean section, and the technique of the operation is the same as has been dealt with in that chapter.

(4) **Abdominal Hysterotomy.** This method of evacuation in the second trimester of pregnancy is becoming more and more popular, and deservedly so. The technique may be described as that of a miniature Cæsarean section. It can be done in many cases where a rapid method of evacuation, unattended with shock,

is necessary. Secondly, one of the chief advantages of this method is that there is no possibility of sepsis, provided the case has not been previously infected, nor is there any risk of cervical lacerations, attended with shock, hæmorrhage, and possible introduction of septic infection. A third and a distinct advantage is that this operation can be combined with that of sterilisation of the patient—a procedure necessary in certain cases where it is undertaken for grave complications, such as heart disease, tubercular infection of the lung, etc. We have resorted to this operation frequently, and particularly in cases of hydatidiform mole, where it undoubtedly presents very many advantages over the vaginal method of evacuation. It can be done at one sitting, when all the vesicular contents can be freely evacuated; and an advantage which is apparent, when the operation is done, is that one can see the uterine musculature and decide whether the chorionic villi have already invaded it or not. This will help the obstetrician to decide whether, in view of the malignancy or the potential malignancy of the case, hysterectomy is necessary.

The *technique* of this operation is exactly similar to that of a Cæsarean section. An incision is made in the upper uterine segment; the uterus opened into, the contents evacuated, and the uterus closed with sutures which do not involve the endometrium. In cases where sterilisation has to be done, two courses are open:—

(a) To perform a supravaginal hysterectomy. A supravaginal hysterectomy, even with retention of the ovaries, produces an artificial menopause, which is not always desirable in young women.

(b) By the exclusion of both Fallopian tubes. This can be effectively done in one of two ways: by removing the whole of the Fallopian tube up to the uterine end and invaginating that end in the uterine musculature, or by resecting a portion of each Fallopian tube and invaginating the cut ends between the layers of the broad ligament.

The latter alternative permits of the possibility, should the occasion arise or the patient desire it at a later date, of freeing the medial cut ends of the Fallopian tubes and re-establishing patency so as to allow of a possible occurrence of pregnancy.

(5) **Exposure to the Roentgen Rays.** This is a method that has been advocated for promoting abortion. It is not quite clear whether the abortion, if it does occur by such exposures, may not be followed by other consequences. The ovaries must be simultaneously affected by the Roentgen rays and, further, should a subsequent pregnancy arise, one is not quite sure if the pregnancy will develop along physiological lines. The method is not one that

INDUCTION OF PREMATURE LABOUR

is free from risks and cannot be said to have any advantage over some of the other methods already described.

Prognosis. The prognosis in therapeutic abortion depends upon the particular condition which necessitated the abortion, as well as the procedure adopted for this purpose. It is not possible to give any definite prognosis so far as the underlying factor that necessitated the abortion is concerned, but with regard to the prognosis for the actual operation, there should be little or no risk, provided care is taken in the choice of the operation and the correct technique adopted. In certain cases vaginal or abdominal hysterotomy would offer a much better outlook than the method of forcible dilatation for the reasons already emphasised.

Induction of Labour

Labour may be induced at one of two stages (1) before a woman has reached term or (2) at term or after term. In the former case we speak of induction of premature labour, and in the latter, where the woman has already reached term or is possibly past the term, we speak of induction of labour.

The indications for the two operations are obviously different.

Indications for the Induction of Premature Labour. This operation is done only after the child is viable, but inasmuch as the viability of the child does not synchronise with the possibility of its survival after birth, few will attempt to induce premature labour with the hope of getting a live child capable of surviving before the thirty-fourth week of pregnancy.

It is done largely in the interests of the mother and occasionally in the interests of the child. The chief indications are:—

- (1) Contracted pelvis.
- (2) Pre-eclamptic toxæmia or chronic nephritis complicating pregnancy.
- (3) Cardiac lesions.
- (4) Tuberculosis pulmonum.
- (5) Placenta prævia or accidental hæmorrhage.
- (6) Chorea gravidarum.
- (7) Hydramnios.
- (8) Habitual death of the foetus *in utero*.
- (9) Excessive size of the child at previous deliveries.
- (10) Certain cases of diabetes.
- (11) Pyelitis or pyelonephritis complicating pregnancy.
- (12) Certain rare cases of mental instability occurring during pregnancy.

We shall take these indications *seriatim* and discuss the proper place of induction of premature labour in their treatment.

(1) *Contracted Pelvis.* The place of induction of labour in the treatment of contracted pelvis has been described *in extenso* in the chapter on that subject. It is no doubt true that if labour is induced some weeks earlier in certain cases of contracted pelvis the child may be born through the natural passages, either spontaneously or by the aid of minor operative procedures. But such a child is premature, and it must be realised that it is born with certain handicaps which may make it difficult for it to survive the postnatal period. But the chief objection to this operation lies in the fact that at present there is no reliable method of judging how far induction of premature labour is necessary. The Munro-Terr-Müller method, and other methods that are often utilised for this purpose, give only a rough idea of the possibilities of delivery through the natural passages, or of the degree of difficulty that may be experienced. Those who have had a large experience of test labour will realise what surprising results are obtained with cases at term which, early in labour, present an apparent degree of disproportion which causes anxiety to the obstetrician. The greater and more extended use of test labour, followed, if it fails, by a lower segment Cæsarean section, would appear to have displaced induction of premature labour from the prominent position which it occupied as a method of treatment in cases of contracted pelvis. It has been our experience that few cases have had to be treated by induction of premature labour. We very much prefer to wait till the woman is at term before deciding whether to allow test labour, or alternatively to resort to a Cæsarean section. We believe that by such means a larger number of children can be saved with no additional risk to the mother.

(2) *Pre-eclamptic Toxæmia or Chronic Nephritis.* These offer an indication for induction of premature labour. When a patient has been treated for some time—ten to fourteen days—for pre-eclamptic toxæmia and is not responding and the risk of eclampsia is increasing, or it is found that although the imminent risks of eclampsia have passed, there is a persistent albuminuria, the necessity for induction of labour should be seriously considered. It has been conclusively proved that in such cases, if the pregnancy is allowed to continue, permanent damage to the kidney or to the vascular system is inevitable, besides the possibilities of eclampsia supervening at any period subsequently. The ideal method of treating such cases would therefore be by induction of premature labour, and in such cases it is not possible to take into serious consideration the interests of the child,

(3) *Cardiac Lesions.* The indications and the conditions under which induction of premature labour should be resorted to in certain cardiac lesions have been fully elaborated in the chapter dealing with heart diseases complicating pregnancy. We would, however, mention this fact--that induction of premature labour is not the proper line of treatment to adopt when one is dealing with a decompensated heart in a pregnant woman; on the other hand, in those cases where the decompensation has been noted previously and the patient has responded to rest and if necessary digitalis, the question whether pregnancy should be allowed to continue or whether in the interval, when the condition of the patient is fairly satisfactory, pregnancy may not be terminated, is a serious matter to be decided by the obstetrician. In selected cases, therefore, induction of premature labour would appear to be justifiable in cardiac lesions.

(4) *Tuberculosis of the Lung.* This was one of the conditions where formerly premature labour was more frequently resorted to. It would appear, however, that pregnancy, as it advances, has beneficial effects in this condition as the increasing size of the uterus presses on the diaphragm and produces a condition akin to artificial pneumothorax. This clinical observation, however, may be noted, that woman with pulmonary tuberculosis, although they show a surprising amount of improvement in general health in the later months of pregnancy, unfortunately break down rapidly subsequent to confinement. It does not appear to be necessary, therefore, to resort to induction of labour in such cases, except it be in the interests of the child when the woman is rapidly getting worse, and the condition of the foetus is good.

(5) *Placenta Prævia or Accidental Hæmorrhage.* The condition of placenta prævia is one associated with uncertainty as regards the possibility of hæmorrhage and the degree of hæmorrhage. We have realised that where a placenta prævia has been diagnosed, whether in a primigravida or multipara, it is dangerous to allow the woman to continue, even in an institution, as a sudden hæmorrhage may occur at any time and produce a dangerous degree of collapse. Under such circumstances it would appear to be more rational to resort to termination of pregnancy, preferably by a Cæsarean section, if it be a central placenta prævia, to avoid the risks incidental to both mother and child. In minor degrees rupture of the membranes may suffice.

In cases of accidental hæmorrhage, where bleeding is severe or is slight but persistent, evacuation of the uterus must be undertaken.

(6) *Chorea Gravidarum.* In severe cases of chorea there is grave risk to the mother, and it is particularly desirable that

premature delivery should be brought at not be allowed to continue till it is too able to respond to treatment.

(7) *Hydramnios*. The question of labour for this condition will depend on the amount of fluid in the amnion. If the patient is restless with dyspnoea and it is desirable to terminate pregnancy, one may puncture the membranes through the abdominal wall as when performing a paracentesis abdominis. Within the course of twenty-four hours the woman usually delivers herself with complete relief of the distress. There is no usual risk of shock, collapse, or postpartum haemorrhage. The child may be premature, but the mother usually recovers and the possibilities of survival of the child are not so limited, that one is not justified in allowing the operation for the sake of the foetus.

(8) *Habitual death of the foetus* 'rare condition; it is unassociated with a infection. Where the history points to period of pregnancy, perhaps about the end, it is justifiable to induce labour a week before delivery, saving the life of the foetus.

(9) *Excessive Size of the Foetus.*
cases that the mother bears excessively of the child being over ten pounds, a twelve it presents problems in delivery for the child as well as for the moth is obtained it is justifiable to induce pre date.

(10) The question of whether induc-
times be employed in cases of *diabetes*
the improved methods of treatment av-
cating pregnancy, the prognosis of this
has considerably improved ; but there a
foetus is likely to occur in the last few
labour should be induced in such ca
unduly large child is common, and n
inducing labour prematurely.

(11) In *pyelitis* the pregnant uterus is to be kept in position to free drainage through the ureters. In such instances it is better to induce premature delivery, the underlying condition being effectively treated. This is rarely necessary in the majority of cases.

(12) Lastly, in certain cases of *mental instability* which have not necessarily reached the stage of mania, one has to consider the possibility of premature induction of labour with a view to relieve the further strain and stress on the mental condition resulting from the prolongation of pregnancy.

Indications for Induction of Labour at Term or after Term.

Induction of labour at term or for postmaturity is undertaken for entirely different considerations. It is particularly indicated in cases where the increase in the size of the foetal head as well as the less efficient head-moulding due to the harder cranium, will constitute a difficulty at delivery. In a postmature child, the degree of mouldability is considerably reduced. The child may also increase in size generally, but the chief difficulty arises during delivery of the head and the shoulders. It is unwise in the majority of cases to allow the woman to go much beyond the expected date of confinement, and it is a safe rule to induce labour if the woman has passed the probable date of confinement by a week or a fortnight at the latest.

Prognosis. With a more perfect technique and particularly with the medicinal methods of inducing labour, the prognosis so far as the mother is concerned should be favourable. The chief risks are those incidental to infection.

So far as the child is concerned, there is an added risk in the induction of premature labour which is directly proportional to the period of pregnancy at which induction is carried out. It also depends upon other factors such as the particular pathological condition which necessitated the induction. A premature child, passing through a narrowed pelvis, is more likely to suffer intracranial hæmorrhage than a mature child. This fact has to be taken into account in deciding on the advisability of inducing labour in cases of contracted pelves. Further, the presentation of the foetus has also got a bearing on the prognosis. It is always desirable to convert a malpresentation into a cephalic presentation so as to judge of the possibilities of the head going through when labour is induced in cases of contracted pelves.

METHODS

Several methods are in use for induction of labour, the chief of which are:—

- (1) Rupture of membranes.
- (2) Introduction of bougies.
- (3) Dilatation of the cervical canal with metallic dilators or hydrostatic dilators.
- (4) Medicinal methods.

(1) **Rupture of Membranes.** This is one of the oldest methods available for inducing labour. A sound or a suitable instrument is passed through the cervical canal and the membranes punctured. It is simple and can be done aseptically. For a long time this method was given up on the ground that draining of the liquor amnii was not always in the best interests of the foetus. Recently, however, the method has been revived, and we must confess that, in suitable cases, it appears to be a safe and a certain method; *albeit* the duration of labour and the time of its onset may not always be accurately predicted. This method is chiefly employed in cases of hydramnios, in the toxæmias of pregnancy, in conditions like placenta prævia and accidental hæmorrhage. It is not desirable to attempt it in elderly primiparæ, or in patients with a long and rigid cervix or in cases of contracted pelvis.

(2) **The Introduction of Bougies.** This is also known as Krause's method of induction. It consists in passing two or more gum elastic bougies through the cervical canal into the uterine cavity, between the membranes and the uterine wall. The bougies must be properly sterilised and they must be passed gently, so as not to encroach upon the placental site. They are left in position for eight to forty-eight hours, by when the uterus should have begun to contract. They should not be removed till labour is well established. Indeed they may be left to be delivered with the placenta.

The risks incidental to this method are:—

- (i) that occasionally the placenta may be separated, giving rise to hæmorrhage, and
- (ii) that the risks of infection are greater as the bougies communicate with the outside.

This method has been largely given up at present.

(3) **Dilatation of the Cervical Canal.** This is a time-honoured method of inducing labour. The cervix is dilated by a few metallic dilators such as Hegar's dilators, and then one or other of the hydrostatic bags is introduced. We have already stated that we do not commend the use of laminaria tents for inducing abortion, and the same holds good for the induction of premature labour. When the cervix is dilated sufficiently to admit two fingers, the use of hydrostatic dilators may be considered. There are several of these, but the most commonly used is Champetier de Ribes' bag.

The conditions under which this bag can be used have been elaborated in the chapter on placenta prævia.

We do not advocate the use of intra-uterine injections, such as glycerine or plugging of the vagina or cervix, as methods of inducing labour. We consider that these practices should be entirely

discarded, as they are ineffective and attended with serious risks of sepsis.

Where immediate delivery is needed, one can more safely resort to vaginal or abdominal Cæsarean section, depending upon the particular circumstances connected with the case, than any of the uncertain methods of inducing labour which carry with them the risks of sepsis, lacerations of the cervix, shock and hæmorrhage.

(4) **Medicinal Methods of Induction.** This method is much more successful if the woman is at term or past the probable date of delivery. There are variations in the details of the medicinal methods employed, but usually there is a combination of castor-oil, quinine, and pituitary extract. One routine adopted is that the woman is given a dose of castor-oil, one ounce, at 6 A.M., followed by a large soap and water enema at 8 A.M., and then by quinine, 5 to 10 grains by mouth. If labour does not come on, a small dose of pituitary extract is given two hours later and repeated at intervals, if necessary. In some cases labour comes on; in others it does not come on for periods varying from forty-eight to seventy-two hours. Occasionally, it may be necessary to repeat this course three or four days later. The question as to whether quinine or pituitary extract may occasionally bring about foetal death has been fully discussed in recent literature. The method of medicinal induction of labour which we have adopted for some time is slightly different. On the ground that quinine is a factor that may be responsible for the occasional death of the foetus, we have discarded the use of this drug altogether in the medicinal method. Our practice is to give the woman at 6 A.M., $1\frac{1}{2}$ ounces of castor-oil; 9 A.M., soap and water enema; 12 noon, one-sixth c.c. of pituitary extract, and repeat this at intervals of three hours till the patient has had one-half c.c. of pituitary extract; in other words, three doses. If labour does not begin within twenty-four hours, it is desirable to leave the woman alone for the time being, and repeat the same procedure after three or four days. Rarely have we failed at the second attempt to induce labour.

We should emphasise the need for small doses of pituitary extract. It has been mentioned that pituitary extract may sometimes cause tonic contractions of the uterus and even rupture. But the small doses that have been suggested, if given with due consideration of the condition of the uterus at the time of administration, do not in our opinion carry any risk. Occasionally labour pains start and then pass off. In such cases we have combined the medicinal method with artificial rupture of the membranes—an almost certain method of inducing labour.

Accouchement forcé, or forcible dilatation of the cervix, followed by immediate delivery, is an unfortunate expression which is still prevalent in obstetric literature. Whatever might have been the justification for this method of delivery at one time, there is little scope for it now, in view of the more safe operative procedures that have been elaborated to meet such cases of emergency. A woman may require immediate delivery in certain rare cases, but it is not justifiable to submit her to any forcible methods of cervical dilatation, particularly by branched metallic dilators, which cause serious lacerations and the possibility of disaster overtaking the obstetrician during the process of dilatation. We have for some years relegated these instruments to the obstetric museum and do not propose to use them again. Bossi's dilators, Frommer's dilators, De Signeux's dilators have all had their day and may take a well-earned rest as relics of a bygone era!

SECTION VIII

PATHOLOGY OF THE PUERPERIUM

CHAPTER LI

PUERPERAL INFECTION

IN all well-conducted labours, a physiological puerperium is anticipated. There should have been little or no damage to the patient at labour, and except for minor disturbances such as after-pains and the initial engorgement of the breasts there should be freedom from discomfort. The puerperium should be apyrexial, the pulse rate normal, the general condition should be as satisfactory as it was before the period of pregnancy and delivery; and in fact, in the majority of cases, the woman should not feel the strain of labour or of the puerperium.

Unfortunately, this happy state of affairs does not always exist. Several complications may occur during the puerperium, the chief of which is septic infection.

The term "*puerperal fever*" was originally used to denote the morbid condition of the woman in the puerperium when the chief symptom was a rise in temperature. For long, the nature of "*puerperal fever*" was not clearly understood and hence various theories were held regarding its nature. During the past 25 years considerable progress has been made in the study of puerperal infection, nevertheless the death rate has not diminished very much. As early as 1773 Charles White of Manchester, discussing the management of pregnancy and labour, advocated good ventilation, clean rooms, clean linen and removal and isolation of patients in separate rooms. He also insisted that after removal of any patient with puerperal infection from any room, the curtains should be washed, and wood-work cleaned with vinegar. In 1863 Mayer Hofer demonstrated micro organisms in the lochia of puerperal women. In 1869 Coze and Feltz found small bodies isolated or arranged in chains in the blood of a patient with puerperal fever. The same organisms were also found in the lochia. Pasteur in 1879 demonstrated the causal relationship of these organisms to puerperal fever; but long before this however Charles White in England, Simpson in Scotland, Semmervais in Austria and Holmes

in America demonstrated the contagious nature of the puerperal fever and established measures for its control. Lister, by the introduction of antiseptic surgery has done a great deal in the control of sepsis in general surgical work; but in the field of obstetrics it has not gained much headway. In the past 25 years considerable progress has been made in the study of puerperal sepsis primarily in the causation, prevention and treatment of this condition.

ÆTIOLOGY

"Puerperal fever" is the term commonly used to denote septic infection of the genital tract following full-time labour or abortion. It differs in no way from surgical wound infections, except in the peculiar nature of the parts exposed to invasion by the micro-organisms, such as the large raw uterine surface with the widely open blood channels left as a result of separation of the placenta during the third stage of labour. Placental site is the usual venue of infection; added to this, there may be lacerations of the perineum, vagina or cervix which may be fertile pabula for the growth of organisms.

BACTERIOLOGY

A large number of organisms have been isolated from cases of puerperal infection. Among the chief of these are streptococci, hæmolytic and non-hæmolytic, staphylococci, gonococci, *bacillus coli communis*; *bacillus aerogenes capsulatus*, *bacillus diphtheriæ*, *bacillus typhosus*, *bacillus tetanus*, pneumococcus and other forms of bacilli, *bacillus Welchii*, etc. The commonest of these micro-organisms are the streptococci (hæmolytic and non-hæmolytic), *bacillus coli*, staphylococci and the gonococci. Anaerobic streptococci, a normal habitant of the vagina may in the presence of damaged tissues, take on pathogenic activity and grow rapidly and cause puerperal infection. *B. Welchii* from the nearby gut may also cause infection of the genital tract in the presence of damaged tissues on which they can thrive. But, it is chiefly the hæmolytic streptococci with which we are mainly concerned since they cause the most severe forms of puerperal sepsis in human beings. Quite a lot of work has been done recently in connection with this organism. A preliminary investigation was done in 1920 by Lancefield which was later on continued by Hare and others. The present position is that hæmolytic streptococci consist of nine groups A—K (I and J excepted). These groups have been identified by precipitin test which is done as follows;—

Rabbits are inoculated with streptococci of any group until they produce an immune serum. Streptococci to be tested for their group are killed and an extract is made from their bodies. The serum of the rabbit immunised against group A will give a precipitate when mixed with above extract if the organisms under test belong to group A. Of these nine groups, group A alone is important since it causes 90% of all serious streptococcal infections. Of the other groups, group F may be found antenatally in the vagina and may possibly be pathogenic at times. Group G is also of the same characteristic, but can cause infection only in the presence of other organisms. The other groups of organisms are unimportant and may cause trouble only in animals like cows, guinea pigs etc.

The various groups among hæmolytic streptococci have been further subdivided into types and of these, group A alone is known to have at least 23 types. This work was done by Griffith working in the Ministry of Health in London. The types are identified by an agglutination test; but instead of the extracts the dead germs themselves are used. Agglutination occurs and can be recognised macroscopically or microscopically when an emulsion of the bodies of any given type of group A or other streptococci is mixed with the serum of a rabbit which has been immunised against that individual type.

Antenatal examinations and culture of vaginal organisms proved the existence of some streptococcus hæmolyticus in the vagina but on following up of these cases no sepsis developed—probably these were the non-infective non-pathogenic organisms like groups B, C etc. Group A hæmolytic streptococci are only very exceptionally found in the vagina since the vaginal flora and reaction of vaginal secretions endow an immunity to this tract from such organisms as shown by Sharmann and Cruickshank.

Mode of Infection. When one considers the problem of puerperal sepsis, one is confronted with a strange experience which at first sight appears to be most contradictory and puzzling. It is the experience of most obstetricians that occasionally a case which was delivered spontaneously without a perineal laceration, and without even one vaginal examination having been made, develops a severe type of sepsis which may even prove fatal. On the other hand, a case which has had a very strenuous labour with an operative delivery not always carried out under ideal conditions or surroundings escapes infection and runs an apyrexial puerperium. More often, where active interference has been necessitated, the cases do show a certain amount of reaction, fortunately mild in the large majority of them. The question arises as to why such

variations should occur in regard to infection. Unfortunately a bacteriological examination of the vaginal flora before and after delivery, far from throwing any light on the subject, has only made the position more complex and puzzling. When such a bacteriological investigation was carried on by us, it was found that even in cases where aerobic and anaerobic hæmolytic and non-hæmolytic streptococci were isolated from the vaginal smears before delivery, the patient had an apyrexial puerperium. Again, during the puerperium it has not been infrequent to isolate streptococci in cases where no evidence of clinical infection was manifest.

It would appear from a consideration of these observations that three primary factors have got to be borne in mind, namely, the soil, the seed and the sower. By the soil we mean the natural resistance of the patient and the condition of the genitalia before and after delivery. The seed may here be represented by the micro-organisms which are sown into the soil by a careless operator. The sower is the obstetrician or the midwife in charge of the case and to whom the ultimate responsibility of the delivery is entrusted. The mode of infection, therefore, can best be recognised by a thorough appreciation of all these factors. If the vitality of the patient is lowered, and if the genital tract is subjected to bruising or laceration, and so the vitality of the genital tract brought below par, the chances of micro-organisms gaining a footing and thriving there are definitely increased.

The micro-organisms may gain entrance to the sites of infection in one of three ways. These are described as autogenous, endogenous and exogenous puerperal infection. Autogenous infection is one where the organisms are present in some part of the body of the patient, for example in an ulcer on the scalp or urinary infection with *B. Coli* wherefrom the organisms are transferred to the genital tract during or shortly after delivery. An infection is considered endogenous when the organisms are present in the genital tract itself where they thrive and grow without causing any pathogenicity but under certain circumstances they develop pathogenicity and invade the tissues. Anaerobic streptococci are the best example of this type of infection. Exogenous infection is one where the organisms are transferred to the genital tract from an outside source by the medical or nursing attendant or any others on attendance on the patient. The source of infection may be the attendant's throat or respiratory passages or an outside agency like skin, dust, faeces etc., or from surroundings of the patient. Smith, Colebrook and others have proved that at least 5% of all population are carriers of hæmolytic streptococci in their nose, throat or respiratory passages and these are transferred directly to the genital tract by the attendants at the time

delivery or soon after, in the presence of a raw area—the placental site or other lacerations produced during the course of delivery.

Auto-infection. By this term is meant the infection is of an endogenous nature, that is to say, the organisms have remained latent somewhere in the genital tract and have flared up consequent upon some damage during delivery. Authentic cases are on record where auto-infection has been responsible for puerperal sepsis. Occasionally gonococci, streptococci and *bacilli coli communis* may be present in the generative tract, and in the presence of lacerations or due to the lowered vitality of the patient may increase in virulence and cause a severe attack of sepsis. It should be clearly realised that in the majority of cases the infection is exogenous and not endogenous; unless, therefore, overwhelming evidence is available to exclude the possibility of exogenous infection it is a grave mistake for the obstetrician to console himself with the idea that auto-infection has been the cause of puerperal infection. In the majority of cases such infection is due to the physician or the midwife concerned in the delivery. There are several recorded cases occurring in epidemic form, when from a focus of infection in the obstetrician or midwife a general puerperal infection has occurred in a series of cases.

A source of infection to which a great deal of attention has been paid recently is droplet infection, generally due to an acute rhinitis, pharyngitis or tonsillitis. Obstetricians or midwives who suffer from any such infective conditions should abstain from attending cases of delivery till they are free from the possibilities of acting as carriers of infection. Such droplet infection would appear to be much more frequent in colder countries than in the tropics; and perhaps the close atmosphere, with lack of free perfusion of air, under which these deliveries have to be conducted in particular seasons of the year, may account for the greater predominance of cases of droplet infection in such countries than in the tropics. The surroundings in which the patient has to be delivered have also an obvious bearing upon the occurrence of puerperal infection. Dirt and dust, effluvia from an underground sewerage, etc., are all factors to be borne in mind. In tropical countries the danger is increased owing to the unfortunate practice that is prevalent of attendance at delivery by untrained midwives with no knowledge of asepsis, whose first inclination is to make an internal examination when the woman is said to be in labour. Side by side with this serious risk ought to be remembered the possibility of a self-examination by the patient. The use of dirty linen, coitus during the later weeks of pregnancy and generally the insanitary habits of the natives are all factors of sepsis.

Other factors to be taken into consideration are the following:—

(1) *Age and Parity.* The possibilities of infection are greater in elderly primiparæ and this may be due to a greater risk of trauma resulting during child-birth.

(2) *Duration of Labour.* This has a bearing upon infection, and in cases of prolonged labour it may be stated that the risks are definitely greater, particularly if the membranes have been ruptured for a number of hours.

(3) *Assisted Labour.* The chances of infection in such cases are definitely greater than in normal labour. Much will depend upon the nature of the assistance and the stage at which this was required. Manual removal of placenta, intra-uterine manipulations, modes of delivery resulting in laceration of tissue and hæmorrhage after labour are all factors which will increase the incidence of sepsis.

(4) *Associated Conditions.* There are a number of associated factors which, by lowering the vitality of the patient, increase the possibilities of infection. Among these may be mentioned anæmia, wasting diseases, diarrhœa, dysentery, antepartum hæmorrhage, toxæmias of pregnancy, particularly albuminuria and eclampsia, and possibly certain endocrine deficiencies. Among the conditions that may lower the local resistance of tissues in the genital tract may be mentioned lacerations and bruising of the soft parts, particularly tears of the cervix, retention of portions of membrane or placenta or blood-clots, etc. It has been shown that deficiency of vitamin A, the anti-infective vitamin, is a factor to be taken into consideration in the causation of puerperal sepsis.

MODE OF SPREAD OF INFECTION

When the micro-organisms have gained admission into the birth canal they may develop in a localised area, their toxins being absorbed into the blood stream. The organisms may thrive in the placental site, in the cervix, vagina or perineum, and if lacerations be present in any of these areas they may give rise to what are known as "puerperal ulcers." Such organisms are generally the pyogenic organisms, and by destruction of the tissues they cause sloughing of the parts and discharge a large quantity of putrefying material.

On the other hand, some organisms after gaining admission at any of these sites may enter the deeper structures—the uterine musculature—and then spread by one of three channels:

(1) by the lymphatic stream;

- (2) through the blood vessels ;
- (3) by contiguity of the tissues.

In these cases not only do the toxins find their way into the general circulation, but the micro-organisms themselves are disseminated when they invade the lymphatic or blood vessels and may get deposited in various situations, giving rise to manifestations of a generalised infection with the development of secondary foci of infection. Where the infection spreads by contiguity of tissues, it may start with infection of the vulva as a vulvitis, spread to the vagina as a vaginitis, and thence upwards as a cervicitis or endometritis, and later it may involve the Fallopian tubes resulting in a salpingitis, or the ovary giving rise to an oöphoritis. The spread may also be into the pelvic cellular tissue, giving rise to parametritis, and later the pelvic peritoneum may be involved, giving rise to perimetritis. If the infection spreads further, a general peritonitis may result. More commonly, however, the infection spreads through the lymph stream or the blood stream, giving rise to a pelvic cellulitis or peritonitis and infection of the tubes and ovaries. In some cases a diffuse thrombophlebitis may be set up in the pelvis. Not infrequently all the three types of spread of infection may be present in the same case.

When the micro-organisms enter the blood stream the result may be either a septicæmia or a pyæmia. This depends upon the nature of the organism ; generally, pyogenic organisms when they gain admission into the blood stream are more likely to cause a pyæmic infection with foci of infection in different parts of the body. When micro-organisms enter the blood stream the condition is sometimes known as "bacteriæmia."

PATHOLOGY

The pathological lesions that may be found in cases of puerperal infection vary with the nature and severity of the infection and with the particular part of the genital tract affected. The lesions may be found in the vulva, vagina, cervix, uterus, Fallopian tubes, ovaries, the pelvic cellular tissue, pelvic peritoneum, general peritoneum, and in other parts of the body when a generalised infection occurs, as in cases of bacteriæmia.

Lesions of the vulva and vagina are not infrequent, particularly after operative deliveries. The tears that result may become infected and later ulcerate. The term "puerperal vulvitis" has been given to this condition, but with improved hygiene and antiseptic measures should be rare. A severe form of vulvitis may result from the use of

from these ulcers, but the greater danger is the possibility of an upward spread of the infection. In severe cases where labour has been prolonged and the presenting part has been jammed in the pelvic cavity, pressure necrosis resulting therefrom may cause sloughing of large areas. If such sloughs are formed in the anterior or posterior vaginal walls, they separate at the end of the first week of the puerperium, resulting in the formation of fistulous openings between the bladder and the vagina or between the vagina and the rectum. In cases where extensive damage has been done to the vagina, after the separation of the sloughs, the ulcers tend to heal; but severe cicatricial contractions may result, almost occluding the whole of the vaginal cavity, so that the insertion of even one finger is rendered difficult. Lacerations of the perineum may also tend to cicatrize irregularly.

Cervix. Lacerations of the cervix are not infrequent, especially when delivery is effected before full dilatation and effacement of the cervix. Cervical lacerations when they become infected, may slough and the infection may easily spread to the endometrium and parametrium.

Uterus. The most common lesion in cases of puerperal infection is acute endometritis. The uterine cavity immediately after delivery presents a large raw surface with sinuses which are occluded by large thrombi. If infection spreads to the uterine cavity micro-organisms can thrive very easily on the raw area and on the thrombi, the result being that the whole of the endometrium may be involved in the inflammatory process and may tend to slough. When infection is due to virulent organisms such as streptococci, it may not be limited to the endometrium, but the organisms may spread into the musculature of the uterus and then reach the blood stream or the lymphatics. When, however, the infection is limited to the endometrium, a condition spoken of as *putrid endometritis* results, wherein will be found a thick layer of necrotic material which lines the uterine cavity and in which are embedded large numbers of the causative micro-organisms. Behind this thick necrotic layer will be found a layer of leucocytic infiltration known as the "zone of reaction," the activity of which varies with the virulence of the organisms and the extent to which they are limited to the necrotic area by the patient's powers of resistance. Beyond this zone of leucocytic infiltration is a zone of more or less normal tissue, perhaps slightly congested and infiltrated with inflammatory cells. Where the organisms are very virulent the endometrium may not show a definite necrotic area and the organisms are found throughout the

thickness of the uterine musculature, the zone of leucocytic infiltration being absent or very imperfectly developed.



FIG. 211.—Puerperal sepsis; streptococcal invasion of the uterine musculature.

Salpingitis. The infection spreads to the Fallopian tubes by one of three ways :

- (1) by contiguity of tissues through the uterine end of the Fallopian tube ;
- (2) by spread through the pelvic cellular tissue or peritoneal tissue ;
- (3) by the lymphatics.

When infection of the tubes occurs by spread through the uterus the infection is generally bilateral. The result of such infection depends upon the micro-organisms responsible. When pyogenic organisms gain admission, the lining membrane of the Fallopian tube is damaged, the fimbrial extremity becomes inflamed and later occluded, and the tubal wall becomes thickened, while a purulent exudate distends the tube, converting it into a pyosalpinx. If, however, more virulent organisms gain admission, other changes may take place before the tube can go through these pathological phenomena, and in cases of true bacteriæmia the Fallopian tube may not show any inflammatory changes. When inflammation of the tube occurs, such inflammation is not generally confined to the tube but involves also the ovaries, the pelvic cellular tissue and the pelvic peritoneum.

Oöphoritis. Inflammation of the ovaries is not uncommon when either the pelvic cellular tissue or the Fallopian tubes are

affected. As a result of such inflammation adhesions may form between the ovary and the Fallopian tube, and in some cases the ovaries, the tubes and the pelvic cellular tissue may all be involved in a dense mass of adhesions which may be found to fill the whole of the pelvis on either side of the uterus and posteriorly. Ovarian infection may also be due to lymphatic involvement.

Parametritis. This is not infrequent in cases of puerperal infection. The most common method of infection is through infected tears of the cervix. In other cases it may be secondary to a septic endometritis. In both cases it is due to infection with micro-organisms through the lymphatic channels. As a result of such infection there is considerable oedema and induration of tissues which later on may go to suppuration. When suppuration occurs, the whole of the pelvic connective tissue may be involved and an abscess develops which later opens into the rectum or through the vaginal fornix, or points above the medial end of Poupart's ligament. In some cases the abscess may burst into the general peritoneal cavity, or it may open into an abdominal viscus, or point posteriorly into the lumbar triangle, or burst through the sacrosciatic foramen. Occasionally the pus may burrow behind the peritoneum and point in the perinephritic area.

Perimetritis. Where either the tubes or the ovaries or the pelvic cellular tissue are involved, it is not unnatural that the peritoneum should share in the general inflammatory process. Pelvic peritonitis is very often associated with pelvic cellulitis, and fortunately in most of the cases the inflammation is confined to the pelvis. In other cases, however, it spreads to the general peritoneal cavity, and indeed general peritonitis is not infrequent in the early stages of severe puerperal sepsis.

Puerperal peritonitis is caused in the majority of cases by streptococci. The most severe cases are those which arise within the first four days after delivery and these cases follow the rapid invasion of the peritoneal cavity by organisms which enter through the lymphatic vessels in the wall of the uterus. There is very often a blood infection and rarely any localised pelvic suppuration. Sometimes peritonitis occurs later in the puerperium, and in such cases an associated localised pelvic suppuration is usually found, either in the tubes, uterus or broad ligament, or sometimes in the ovary. Thus it will be seen that general peritonitis may occur at one of two stages: very early in the course of the puerperium, within the first four days, when it is usually due to lymphatic infection; and later as a secondary phenomenon in cases where inflammation of the adnexa or of the pelvic cellular tissue is present.

Generalised Infection. This occurs in the condition known as "bacteriæmia," and in such cases the micro-organisms may cause either a septicæmia or a pyæmia. The usual micro-organisms found are streptococci, but occasionally pneumococci, staphylococci, *bacillus coli communis*, gonococci, *bacillus pyocyaneus*, *bacillus aerogenes capsulatus*, or several anærobic organisms may be present. The entrance is gained in one of two ways:—

- (1) The lymphatics, being the commonest mode; and
 - (2) Through the blood vessels, particularly the veins.
- The veins responsible for spread of infection are:—
- (1) The ovarian veins which drain most of the placental site.
 - (2) The uterine veins which drain the placental site, the cervix and upper portion of the vagina.
 - (3) The vesicovaginal plexus of veins in relation to the anterior vaginal wall.
 - (4) The rectovaginal plexus of veins in relation to the posterior vaginal wall.

In some cases of bacteriæmia thrombi formed in the veins are invaded by organisms, become loosened and are disseminated. Such infected thrombi when disseminated may produce inflammation and suppuration in the areas where they lodge; and in such cases the term "pyæmia" is used. The infection may thus spread to the lungs, kidneys, joints, pericardium, endocardium, myocardium, thyroid, eyes, brain and the intestines.

Thrombo-phlebitis and Phlegmasia alba dolens. This usually results from the extension of thrombus formation from the pelvic veins and is generally secondary to infection. The veins which may be involved in this pathological lesion are the veins in the broad ligament, especially the ovarian vein, the femoral and popliteal veins and the superficial veins of the leg, especially the saphenous veins. As a result, there is swelling and induration noticed in the groin and in the labium of the affected side; later, the upper part of the thigh is swollen, presenting a white or sometimes yellowish tint. It is hot to the touch and painful and tender, pitting on pressure with difficulty. Soon the whole limb is involved, including the foot. Occasionally both extremities may be involved. The pelvic veins may be found full of infected thrombi and the veins themselves inflamed. There is also marked periphlebitis with extensive inflammatory cedema. The phlebitis may be primary or secondary to pelvic cellulitis, or in some cases the cellulitis may be secondary to a phlebitis.

CLINICAL FEATURES

From a study of the pathological lesions in a case of puerperal infection it is obvious that the clinical features may vary within wide limits, depending upon the nature and extent of the lesion and the particular tissues involved. Broadly speaking, the symptoms may be grouped under two heads:—

- (1) Clinical features due to localised infection.
- (2) Clinical features due to generalised infection.

CLINICAL FEATURES OF LOCALISED INFECTION

As has been already stated, in such cases the micro-organisms have gained admission to some portion of the generative tract, and by developing therein produce a local reaction with absorption of the toxins. This is by far the commonest form of infection, and the clinical features noted are:—

(1) *Temperature and Pulse.* The temperature is generally raised on the second or third day, but in some cases of prolonged labour such infection may occur intrapartum. The pulse rate is also increased but is proportionate to the temperature.

(2) *The uterus* is generally slightly tender and does not involute properly. The fundus of the uterus may therefore be at a higher level than it should be for a given day of the puerperium.

(3) *The Lochia.* The most striking change is noticable in the lochia. This is increased in quantity, has an offensive odour and changes its colour, being more often brownish or black. The method of staining on the diaper will also reveal the fact that decomposition has taken place consequent upon infection. Occasionally decomposed blood-clots or even decomposed pieces of membranes or placental tissue may be present in the lochial discharge.

The patient may complain of some headache and general malaise. The tongue is coated; occasionally there may be a rigor; the bowels are constipated; but the general condition of the patient is not unsatisfactory, and if properly treated the condition may be brought under control. If puerperal ulcers are present the vagina may be warm and tender, and occasionally there may be a certain amount of vulvar and vaginal cedema if perineal ulcers are also present. If the perineum has been sutured it may be found swollen and cedematous and the sutures may cut through.

The special clinical features of a localised infection depend upon the particular tissue affected.

Pelvic Cellulitis or Parametritis. When pelvic cellulitis is present there is generally a rise of temperature, associated with

an accelerated pulse. This may begin on the third or fourth day. In some cases, however, if the patient attempts to get up too early, or if ulcerations lower down in the genital tract are neglected, the infection may show itself at a later stage. The patient may complain of the general manifestations of toxæmia, such as headache, restlessness, sleeplessness and general depression. The fever, which may be continuous at the beginning may later be of a remittent type, or repeated rigors with sweats may occur, with a temperature of the hectic type. The temperature may gradually subside and the local symptoms abate.

On a local examination the exudate in the pelvic cellular tissue may be palpated as a firm resistant swelling at one or both sides of the uterus, filling the pelvis and probably involving the whole of the pelvic organs. When it becomes more chronic the general swelling may be hard, crescentic in shape and no differentiation of the uterus or the adnexa may be possible; this condition is spoken of as the "plaster of Paris" pelvis. If suppuration occurs, softening of some portion of the mass may be felt; and generally the abscess tends to point towards one or other of the vaginal fornices. In some cases the swelling may be palpated abdominally as a hard indurated mass, rising above Poupart's ligament, and the skin may become oedematous and sometimes reddened, indicating that the abscess may point and evacuate itself externally. When the abscess opens it may burst into the rectum, vagina, the bladder, or through the abdominal wall. With the evacuation of the abscess, the pain and tenderness will be relieved and the temperature gradually abates. Cystitis, pyelitis, and in some cases even hydronephrosis may occur. Consequent upon the intrapelvic pressure, cedema of the lower extremities and neuralgic attacks are not uncommon.

Salpingitis, Oöphoritis and Pelvic Peritonitis. The possibilities of infection of the Fallopian tubes, ovary and the pelvic peritoneum have already been discussed under the pathology of puerperal sepsis. When salpingitis and oöphoritis occur there may be an exacerbation of the existing symptoms of uterine infection associated with pain in the lower abdomen, particularly referable to either iliac fossa. There may be some rigidity of the abdominal wall, associated with tenderness and tympanites. The temperature and pulse rate are elevated, and on vaginal examination it may be possible to locate a definite mass on one or both sides of the uterus. When as a result of inflammation, a pyosalpinx or tubo-ovarian mass forms, this may fill the pouch of Douglas. Sometimes the tubo-ovarian abscess bursts into the bladder or bowel, or occasionally after becoming adherent to the anterior abdominal wall opens through it.

Pelvic peritonitis follows many cases of local puerperal infection, such as parametritis, endometritis, salpingitis and oöphoritis. The signs and symptoms depend upon the mode by which the peritoneum is infected. In the majority of cases the inflammation of the peritoneum is due to a lymphatic infection from the endometrium. When the peritoneum becomes involved pain is a prominent symptom; nausea and vomiting may be present. There may be diarrhoea in the early stages, but eventually there is constipation, owing to the lack of peristalsis, and abdominal distension occurs. Mild rigidity of the abdomen is present and the patient draws up her knees to relax the muscles of the abdomen. The expression is anxious and when the disease is well marked the eyes are sunken, clammy sweats occur and the typical *facies hippocratica* develops. The temperature may vary, especially after an initial rigor; the pulse becomes very rapid, the respirations hurried. In some cases the lungs may be involved in a secondary infection.

If the organism is virulent the symptoms become progressively worse. Infection spreads to the general peritoneum. If, however, the infection is limited to the pelvic peritoneum and is mild, signs of localisation soon become apparent, the pain begins to subside, the vomiting ceases and the bowels begin to act. The tenderness and rigidity of the abdominal wall disappears. A bimanual examination may not be of much value; and indeed in some cases, if carelessly done, may result in the bursting of an abscess into the general peritoneal cavity.

When the symptoms gradually subside the temperature comes down, the pulse rate diminishes and the patient gradually recovers; but such recovery is never complete, as in the majority of cases adhesions are left and the tubes and ovaries have been extensively damaged; the uterus itself may be fixed in the inflammatory mass, the omentum and the intestines adherent to all these structures, with the result that the patient becomes a lifelong invalid.

CLINICAL FEATURES OF GENERALISED INFECTION.

The symptoms of this condition may supervene on those of a local infection, and in the majority of cases they come on about the third or fourth day of the puerperium. In some cases a general infection may occur even during the course of labour, the signs and symptoms appearing during the intrapartum stage or within twenty-four hours after delivery. A generalised infection may become evident a week after the delivery, either because of infection occurring in the early days of the puerperium instead of during labour, or because a case of neglected local infection has flared up. A severe chill may usher in the onset of the infection. The temperature rises rapidly to 103° or 104° F., and the pulse

becomes very rapid, frequently out of proportion to the rise of temperature. The temperature persists and gradually shows a step-like ascent. In some cases it may oscillate and there may be frequent rigors indicative of fresh and repeated invasion of the blood stream, and with each rigor the temperature rises further and the pulse accelerates. The general condition deteriorates, the patient looks very ill, with sunken eyes and a muddy complexion. Headache and sleeplessness are constantly complained of; and while the mind may be clear at the beginning, towards the end delirium develops. The tongue becomes furred and dry and nausea, occasionally with vomiting, may occur. This is usually a sign of an associated general peritonitis, in which case a fatal termination is likely to occur in a short period.

The lochia may be scanty and suppressed, in some cases it may be profuse and putrid, depending upon the infecting organisms and the extent of the local infection, in association with the generalised infection. Signs of peritonitis, such as tenderness, rigidity, distension from paresis of the bowels, may appear; and with these signs the temperature may drop and become subnormal, while the pulse rate increases in rapidity and becomes feeble. Cold clammy sweats may occur and the respiration may be sighing. The patient gradually passes into a stage of coma and succumbs. Delirium may be marked. In fulminant cases a fatal termination may occur within a few hours to a day or two. More frequently the disease lasts from a week to ten days.

Infection of the urinary tract may also simultaneously occur. Severe diarrhoea may be a persistent symptom in peritoneal involvement.

An examination of the blood may reveal a leucocytosis with increase of the polymorphs and mononuclears and a decrease of eosinophils. Anaemia rapidly develops due to toxic hæmolysis. If the blood is cultured the presence of micro-organisms, particularly streptococci, aerobic or anaerobic, may be noted.

In cases where a more favourable termination is likely, the temperature shows gradual remissions, the pulse rate tends to slow down, the blood-pressure rises and a general improvement in the condition is noted. The skin becomes warm and the peritoneal symptoms gradually subside, the bowels moving normally and the condition progressively improves.

PRÆMIA

In this variety of general infection the thrombi are infected, and wherever they lodge they give rise to secondary foci of suppuration. The common venous channels through which the

infected thrombi may spread are the ovarian and uterine veins, and later the hypogastric, external iliac or femoral veins may be involved.

Clinical Features. In cases of pyæmia, even more than in cases of bacteriæmia, the symptoms of a local infection are manifest, and in fact there may be gradual subsidence of these symptoms, when suddenly the patient has a rigor followed by an elevation of temperature with an increase in pulse rate. The fever is generally high, ranging between 105° and 106° , and after a profuse sweat it may come down to below normal. Not infrequently, within a few hours or sometimes the next day, the rigor recurs with a sudden rise of temperature. In some cases the chills may occur at frequent intervals within the course of twenty-four hours. They are probably due to fresh invasion by the organism from the septic thrombi into the general circulation. The temperature is of a remittent type. A double rise within twenty-four hours is not uncommon. The disease may last for weeks, sometimes for months. At first the general condition is not seriously affected, but later with increasing rigors and oscillating temperature the patient gradually becomes weak and the condition gets worse. An examination of the blood will show marked leucocytosis with an increase of the polymorphonuclear element. Not infrequently metastatic abscesses develop, the most common seats being the lungs, joints, kidneys, subcutaneous tissues and the parotid. Sometimes metastatic deposits may occur in the brain and give rise to meningoencephalitis.

Invasion by organisms other than streptococci hæmolyticus may be of the following varieties:—(1) Infection by anaerobic streptococci. These cause troubles only in the presence of tissue damage with consequent lowering of tissue resistance. It is really an endogenous infection and usually a mixed one in the majority of cases. The clinical picture of these cases are early appearance of signs of toxæmia, jaundice, cyanosis, dark urine, rapid onset of cellulitis and often the formation of an abscess in the uterine wall giving crepitation of uterus as an exceptional sign.

(2) **B. Coli Infection:**—This is usually an autogenous infection from faecal contamination, urinary spill or conveyance of the organisms from the perineal skin during manipulations in spontaneous or assisted labour.

(3) **B. Welchii Infection:**—Usually occurs in the presence of dead tissues, may be a macerated infected foetus. Infection may be autogenous from the bowels or exogenous from dust or other materials introduced into the genital tract. If in any pregnant, post-abortal or puerperal woman who is the presumptive conceivable subject of uterine infection, the presence of one

is should arouse immediate attention of *austriidum Welchii* or organisms of its

rapid development of jaundice though variable. When deepening jaundice is and pigment in serum and urine, *Welchii* prognosis is grave.

rate out of proportion to an evidently attended by a feeling of well being. cally pale and the blood pressure is low. excruciating pain of the uterine and erminate origin accompanied by shock lesion.

for which general examination does not pulmonary, cerebral or intra-abdominal

can gas be detected in tissues during ct physometra may be useful. Blood anaerobic must be done early in post-es and this will reveal the organisms

of the nature of (i) a local gas gangrene ty and superficial layers of decidua; grene of the uterine musculature which desperate cases; (iii) Peritonitis and emia and metastatic infection.

fection is a rare type usually mild but ss to the blood stream and septicæmia opeless.

OF PUERPERAL INFECTION

uld not develop any pyrexia after con-as been taken. The puerperium should ociated with any disturbing factors. rtain diseases which have a tendency to ig this period but the most important : puerperium is septic infection. For fever occurring during the puerperium as a possible case of puerperal infec- nvestigation reveals that the rise of some other definite cause and that a genital infection. It need not be y case of child-birth the tempera- at least twice a day, in the morning

and evening, preferably every four hours; and any rise of temperature or acceleration in the pulse rate should be noted. A mild rise of temperature in the early stages of the puerperium is often not taken note of by the patient, and if the precaution is not taken to obtain a record of the temperature, it is not unlikely that the obstetrician will only be called in at a stage when the disease has taken a firm root.

Method of Investigation in a Case of Pyrexia during the Puerperium. When a patient develops a rise of temperature in the puerperium a systematic examination is absolutely necessary. The history of the pregnancy and the nature of delivery should be elicited. The following scheme should be followed in all such cases.

History of Pregnancy. It is important to take a careful history of the patient during the period of her pregnancy. Particular care should be taken to elicit any history of illness during pregnancy. Not infrequently, particularly in the tropics, pulmonary tuberculosis, pyelitis, malaria, kala-azar, dysentery and diarrhoea, helminthic infections, etc., may have been present during pregnancy. It is not unlikely that in the puerperium there may be an exacerbation of these conditions owing to the lowered vitality of the patient. Particularly is it true of tuberculosis, pyelitis and malaria. It is also important to note whether the patient was suffering from anæmia, albuminuria or any symptoms suggestive of toxæmia, or from any of the focal infections such as tonsillitis, etc. In such cases a mild form of infection may occur in the puerperium. One must try to elicit the history of possible infection of the cervix, particularly with gonococci. A purulent discharge in the course of pregnancy or a persistent leucorrhœa may sometimes be due to infection of the genital tract with micro-organisms which flares up during the puerperium. Similarly, try to find out if the patient has had attacks of salpingitis prior to or in the early weeks of pregnancy. A history of sexual intercourse in the last few weeks of pregnancy is another of the factors that should be elicited, and it has been already referred to as a possible source of infection.

History of Delivery. It is very important to obtain a full history of the course of labour: Was the labour prolonged? How many hours after rupture of the membranes was the delivery effected? What was the nature of the delivery, whether natural or assisted? If assisted, what was the nature of the assistance and the technique adopted in the process of delivery? Was the child born alive or dead? If born asphyxiated did it respond to treatment, and does it still survive? Was there any rise of temperature and pulse during labour? Was there any other

intra-, or post-partum hæmorrhage, and if so, what method of treatment was adopted to control such hæmorrhage? Were internal examinations made, and if so, how frequently and by whom, midwife or doctor, or both, or by untrained women? Was the after-birth expelled naturally or manually removed, and was it examined and found entire, or were the placenta and membranes incomplete?

Examination of the Patient. After having obtained the history, a thorough examination of the patient should be made. This consists of:—

- (a) General examination, and
- (b) Local examination.

The general examination includes the recording of the temperature, pulse and respiration, the general condition of the patient, her expression, whether the tongue is dry or moist, whether the skin is moist or cold and clammy, and whether the general appearance of the patient fits in with the rise of temperature and pulse rate. The patient should be asked whether she has any particular symptom, such as headache, sleeplessness, restlessness, nausea and vomiting, or diarrhœa, etc.

The different systems should then be examined in detail.

Respiratory System. Note the frequency of the respirations, whether laboured or otherwise. The lungs should be examined for any signs of pleurisy, pneumonia, bronchopneumonia or tuberculosis.

Circulatory System. A careful examination of the heart and particularly of the myocardium is necessary. The sounds must be auscultated. Particularly signs suggestive of a septic endocarditis or a myocarditis must be noted.

Alimentary System. The abdomen should be carefully palpated; any evidence of tenderness, rigidity or distension must be noted, the size of the spleen and liver determined.

Urinary System. The bladder should be palpated to find out if there is any distension, and the fact should be ascertained if the patient is able to pass urine herself or whether there is any incontinence or retention. The urine should be examined, and if necessary a catheter specimen should be obtained. The presence or absence of albumin, of deposits, etc., should be noted and a microscopical examination made for the presence of pus cells or micro-organisms. A cultural examination of the urine is very often necessary, and not infrequently organisms may be isolated such as the *B. coli*. The lumbar region should be palpated to note if there is any tenderness about the kidneys.

Generative System. This requires very careful examination. By abdominal palpation the height of the uterine fundus, whether soft or well contracted, whether it is deflected to one side or the

other, or displaced backwards, whether it is tender and painful. The nature of the lochia should be ascertained—its colour, method of staining on the diaper, odour, quality and quantity.

Local Examination. In the majority of cases it is advisable to make a thorough local examination of the patient, and this should be done in a well-regulated, carefully planned manner, with due antiseptic precautions. It is preferable to have the patient brought to a table and examined in good light.

After cleaning the external genitalia with a suitable antiseptic solution, the perineum should first be examined for the presence of any tear, and, if sutured, its condition noted. It is important to determine whether the tear has involved the rectum or not; and, if so, if faecal matter is liable to contaminate the perineal wound. Note also the presence of any cedema about the perineal laceration. If the perineum has been sutured it may be necessary, in the presence of cedema or of sloughs, to remove the sutures and to lay open the wound, after which the whole of the lacerated surface should be well cleaned up and touched up with an antiseptic such as mercurochrome, tincture iodine, or acriflavine.

The vagina is then examined for the presence of any lacerations or "puerperal ulcers," and after cleaning the vagina with a swab a speculum should be introduced and the cervix examined. It is important not to catch hold of the cervix by means of a volsellum as this may produce an additional tear with the risk of fresh infection. The fornices should be carefully examined to note if lacerations have extended to the fornices and if the pelvic cellular space has been opened up. At this stage the necessity or otherwise of taking an intra-uterine swab for purposes of culture should be determined. We believe this should not be done as a matter of routine, as in the majority of cases it is unnecessary and possibly harmful because of the danger of carrying infection upwards, particularly if there are lacerations about the cervix, or the cervix is unhealthy and ulcerated. In cases where there is definite clinical evidence of an infected endometrium, it is desirable to take an intra-uterine swab for bacteriological investigation.

Technique of taking an Intra-Uterine Swab. When it has been decided to take an intra-uterine swab for bacteriological examination, great care must be exercised in obtaining such a swab. The preliminary toilette should be carefully observed, the perineum and vagina cleaned with sterile saline, a posterior speculum inserted and the cervix cleaned with sterile normal saline. If necessary, the cervix may be lightly held by a sponge forceps and exposed to good light; the special apparatus constructed for taking an intra-uterine swab should be used. This consists of a long glass tubing into which is inserted a thin metallic

wire, at one end of which is attached some sterile cotton-wool. This tubing is closed at the upper end with a plug of cotton-wool. The tubing with the wire inside is now inserted into a test-tube whose mouth is closed with cotton-wool. The whole of it is sterilised and kept ready. When the patient is put on the table and the preliminary preparations have been made, with the cervix

well exposed, the glass tubing is removed from the test-tube, inserted through the cervical canal past the internal os. The metal wire with the cotton-wool attached to its end, which is well within the lumen of the glass tubing, is then pushed through so as to pass beyond its open end into the uterus till it impinges on the endometrium. A swab is thus taken, the wire is withdrawn into the lumen of the tubing, and the two replaced into the sterile test-tube, the mouth of which is closed with sterile cotton-wool and sent to the laboratory for examination.

Simultaneously with the bacteriological investigation of the uterine discharge a blood culture may also be done. A vaginal smear may also be sent for cultural examination. Very often, a high vaginal swab is quite satisfactory for cultural purposes of obtaining the organisms infecting the uterine cavity.

Hæmatological Examination. Along with the above procedure a thorough hæmatological examination is necessary. This consists in estimating:—

FIG. 212.—
Apparatus for
taking uterine
swab in a
case of sus-
pected puer-
peral sepsis.



- (1) A total leucocytic count.
- (2) A differential count of the leucocytes.
- (3) A total red blood corpuscular count.
- (4) The hæmoglobin percentage.
- (5) The colour index.
- (6) The presence of parasites, particularly of malaria or of kala-azar.

The necessity for the examination of urine, both microscopical and cultural, has already been stated. It is wise to examine the motions for the presence of ova and amœbæ. Not infrequently amœbiasis may be the cause of a rise of temperature, or a helminthic infection either with round-worms, ankylostomes or tapeworms may sometimes be present, particularly in the tropics.

Other Examinations. The throat and especially the tonsils should be carefully examined. The presence of other abnormalities, such as skin rashes, involvement of the joints or enlargement of glands should be noted. The breasts should be carefully

examined to note if the nipples are cracked or if there is any distension on account of retention of milk or actual inflammation.

While the presumptive diagnosis is in favour of a puerperal infection in every case where temperature manifests itself during the puerperium, it should by no means be forgotten that there are a number of other conditions which may be responsible for the temperature and which are more liable to occur during the puerperium than at other times. It is therefore necessary to eliminate the presence of these.

Not infrequently, evidence of genital infection may be present, in association with signs of other causes of pyrexia; and it is in such cases particularly that a thorough examination is invaluable when attempting to assess the relative importance of each condition in a given case. It may prove disastrous to treat the case as one of puerperal infection, when all the time the essential factor is an entirely different one. We have known of cases of typhoid fever which unfortunately were mistaken for a severe puerperal septicaemia. *Per contra*, if clear signs of puerperal infection are not present, it should not be presumed that other factors are wholly responsible and that puerperal sepsis is not present. After thorough examination a judicious consideration of the case is the only safeguard to prevent errors in either direction.

After a careful study of the case in the manner outlined above, the presumption that one is dealing with a case of puerperal infection may be arrived at. The questions that arise for consideration then are:—

- (a) Whether it is a local or a general infection?
- (b) Which particular part or parts of the generative tract are affected?
- (c) Whether there is anything retained in the uterus, or it is completely empty?
- (d) What the nature of the causative organism is; whether it is a streptococcus, staphylococcus, *B. coli*, gonococcus, or any other organism?
- (e) What the anatomical structures secondarily involved in the process of infection are: the state of the adnexa, of the pelvic connective tissue, of the pelvic peritoneum and of the general peritoneum; whether there are any secondary or metastatic deposits in other parts of the body?

The difference between a local and a general infection has already been stated. The nature of the temperature curve, the relation between the temperature and pulse, the general condition of the patient, the presence or absence of sleep, rigors, the character

of the lochia and the local condition of the parts will all enable one to come to a fairly accurate conclusion as to whether one is dealing with a local or generalised sepsis. The nature and extent of the infection may also be judged therefrom.

Prognosis

Puerperal sepsis is still the gravest of all the complications of child-birth. In spite of the great advances that have been made in recent years in the technique of aseptic and antiseptic surgery, it is a matter for no small concern to the obstetrician that puerperal sepsis has shown no tendency to decline. The reports from various countries go to prove that of the total maternal mortality nearly 40 per cent. of the deaths are due to puerperal sepsis. The mortality due to sepsis has remained almost stationary in Great Britain for the past fifteen years, and in other countries as well it has shown no definite decline. When it is realised that sepsis is a preventable factor, and that in the large majority of cases it is due to extrinsic and not to intrinsic causes, the extent of the preventable mortality of child-birth can easily be appreciated. In fact, it may be stated that one of the most important directions in which maternal mortality can be reduced is by the avoidance of sepsis.

The prognosis varies with the nature of the infection, the organisms concerned and the extent of involvement of the tissues. A localised infection is not so serious as a generalised infection.

The prognosis must be considered from two points of view:—

- (1) The immediate effects, and
- (2) The remote effects.

(1) So far as the *immediate effects* are concerned, the question is whether or not the patient will survive. Bacteriæmia and pyæmia are of much graver prognostic significance than local infections. Ordinarily vulvitis and vaginitis are not serious if properly cared for in time. Endometritis is of graver significance, but in the majority of cases, with appropriate treatment, it tends to subside. Parametritis may in some cases lead to the spread of the infection into the peritoneum, but otherwise generally yields to treatment. The development of peritonitis is of more serious significance. General peritonitis is almost always fatal. In bacteriæmia or general septiciæmia the mortality is very high, about 70 to 80 per cent. of the patients dying. Pyæmia also has a fairly high mortality. The condition of phlegmasia alba dolens has a more favourable prognosis.

The nature of the invading organism has also to be taken into consideration. Puerperal tetanus is a most fatal complication. Streptococcal infection, particularly with the hæmolytic type, would appear to be more severe than other infections. Infection with *B. coli*, although occasionally of serious import, yields more readily to treatment than infection by streptococci. The gonococcus is said to be less dangerous than the pyogenic organisms, but occasionally it may set up a virulent type of septicæmia which may end fatally.

Among other factors to be considered in arriving at a prognosis are the range of temperature, the presence or absence of rigors, the time of onset of the symptoms during the puerperium, the rate and nature of the pulse (a rapid pulse being a bad sign), the presence of delirium, sleeplessness, pulmonary complications, evidence of septic endocarditis or diarrhoea due to a peritonitis.

An examination of the blood may be of some use in arriving at a prognosis. A rapid decline of the number of red cells or a severe degree of anæmia is of grave significance. A leucocytosis is the rule, but a leucopenia is serious. When the blood culture is positive and bacteria are isolated the prognosis is bad. Complications such as albuminuria, urinary infections, metastatic deposits or other diseases such as tuberculosis, add materially to the risks of the condition. Considering everything, it is risky to give any definite prognosis in cases of puerperal infection—more so in the bacteraemia type. Occasionally, what may appear to be a mild infection flares up into a severe type and ends fatally. Much depends, of course, upon the nature of the treatment adopted in such mild cases. In the more severe type of infection the obstetrician soon realises that little can be done to arrest spread.

(2) *Remote Effects.* When a patient who has had puerperal infection recovers, a certain amount of permanent damage is inevitable, the nature and extent of which depend upon the degree to which the various anatomical structures have been involved. Not infrequently, after a severe local infection and in some cases after a generalised infection, it will be found that the tubes and ovaries are permanently damaged, as well as the parametrium; that adhesions to the surrounding viscera are present; that the uterus is displaced and that adhesions involve the bladder, uterus, tubes, ovaries, intestines, omentum and occasionally the abdominal wall. Rarely, the result of the infection may be a permanently diseased tube, which persists either as a pyosalpinx or as a tubo-ovarian abscess; and this becomes adherent to the surrounding structures, sometimes to the posterior surface of the anterior

abdominal wall and, after months, may burst through it. The appendix is not infrequently involved in this inflammatory mass, and it may be adherent to the abdominal ostium of the Fallopian tube on the right side. As a result of these various sequelæ the patient becomes a chronic invalid and may suffer from dysmenorrhœa, menorrhagia and sterility.

Treatment

The treatment of this condition may be dealt with under two heads—prophylactic and curative.

PROPHYLACTIC

Nowhere is the maxim "prevention is better than cure" more applicable than to this condition.

A great deal can be done through proper antenatal care in its widest sense to ward off the possibilities of infection. The resistance of the patient should be increased in every way. All possible sources of infection should be removed and particular care should be taken to eradicate focal sepsis: the teeth, the bowels and the urinary tract should be attended to. Anæmia, when present, should be treated. Particularly in the tropics we find that it is rare to meet with a pregnant woman whose hæmoglobin percentage comes up to even 80 or 85%. It has been suggested that lack of the anti-infective vitamin A may predispose such cases to infection. On this basis a large number of women have been treated with vitamin A in the shape of cod-liver oil or similar preparations.

Early recognition and treatment of certain complications, chiefly the toxæmias, anæmias, inflammatory lesions such as tonsillitis, pyelitis, cystitis, cervicitis, vaginitis, etc., are necessary to minimise the chances of infection. Conditions likely to lead to lowered resistance, such as antepartum and postpartum hæmorrhage, prolonged and exhausting labour, should be avoided or controlled.

A personal prophylaxis, so far as the patient herself is concerned, is very essential. A clean bath, clean clothing, avoidance of fatigue, especially in the later period of pregnancy, and keeping the general system at its maximum efficiency, will do much to prevent infection.

If there is any infective discharge from the vagina, it should be dealt with antenatally and the cause removed. The avoidance of coitus during the last months of pregnancy has already been emphasised.

Colebrook after elaborate clinical and laboratory studies of a large number of cases has formulated three main conclusions on which we should base our policy for the prevention of sepsis viz:—

(1) that the hæmolytic streptococci of the respiratory tract constitute the chief menace.

(2) that the healthy carrier is as much a source of infection as one with acute inflammation of throat and

(3) that the danger of invasion by the hæmolytic streptococci threatens the parturient woman not from one direction but from many, such as the respiratory tract of those attending on her confinement, her own nose and throat and those of the members of the household as well as other septic foci elsewhere. Besides these, there are two other factors namely the injury to the maternal tissues sometimes unavoidable but in the majority of cases the result of bad technique and those where there is very little trauma and the genital tract infection is the result of organisms which arrive at the spot with outside agencies. The campaign advocated by him wants provision for (1) Prompt detection of catarrhal and inflammatory conditions of respiratory tract due to hæmolytic streptococci in midwifery personnae by taking throat swabs especially when epidemics are present and excluding them from attending on cases (2) Immediate recognition of puerperal infection by hæmolytic streptococci when it occurs and detection of likely source so that further dissemination is prevented (3) arrangements for prompt removal of every infected case from maternity institutions unless there is provision for an entirely separate block with separately housed nursing staff (4) Provision to prevent the mother getting infected from her own throat or from a member of her household by warning her early (5) Prompt bacteriologist's service to detect hæmolytic streptococci in 24 hrs. (6) Insistence or encouragement of institutional midwifery as far as possible, and (7) better education of midwifery personnae in the possibility of multiple sources of infection and in the sound principles of antiseptics.

Other preventive measures are in the field of intercepting the journey of the streptococci from its source to the genital tract. This can be done by (1) the use of masks which must be efficient—i.e., thick enough preferably with an impermeable sheath of material such as paper or cellophane between layers of gauze extending sufficiently long laterally extending beyond the chin and covering the nose and mouth, not worn for more than four hours at a time and after use, discarded into a bowl of lotion (2) Proper antiseptic technique. Thorough washing with soap and water and putting on sterile gowns and gloves and rubbing

the gloves with 30% dettol cream. (3) Disinfection of the vulval skin by washing it well with soap and water and then applying 30% dettol cream over the area (4) Protecting the mother against infecting herself by making her wear a mask and smear her hands with dettol cream. Besides these, the potential dangers from the basin, towel and linen must also be remembered and above all, the personal factor of a high standard of intelligent vigilance and conscientious work on the part of all concerned in the conduct of labour.

A very good rule is never to make a vaginal examination unless it is definitely indicated. We are convinced that in the large majority of cases no vaginal examination is necessary. If the head is properly engaged, if there is no disproportion, if labour is progressing favourably, and if the membranes rupture spontaneously at the beginning of the second stage of labour, and there are no signs suggestive of foetal or maternal distress, there is no reason for a vaginal examination to be made. We do not advocate a routine vaginal examination immediately after the membranes have ruptured, unless there is reason to suspect that owing to disproportion or an abnormal presentation or non-fixation of the head there is a possibility of prolapse of the cord. Where the head is already engaged before the membranes have ruptured and thus fills the pelvic brim or cavity such a contingency cannot arise. Another point to emphasise is that in long labours, the number of vaginal examinations should be strictly limited. Despite all the precautions that one may take, despite the use of gloves and antiseptics, there is an undoubted risk which increases almost in geometric progression with every additional vaginal examination. In view of this risk it has been suggested that a rectal examination may possibly be the better method of ascertaining the facts and at the same time avoiding infection. We have given consideration to this question, but confess that we are unable to see any advantage, as after a rectal examination the same obstetrician has to conduct labour, and in spite of the use of gloves when making the rectal examination there is a certain element of risk which we do not think is negligible. Further, there is the disadvantage that the information obtained from a rectal examination is not so complete as when a vaginal examination is made. Many details connected with the vagina and the cervix and the presenting part cannot be ascertained definitely by a rectal examination. For these reasons, we do not advocate rectal examinations during labour.

A golden rule in the conduct of labour is to avoid trauma as far as possible. It is true that to some extent certain amount is

inevitable ; but in the large majority of cases, if proper precautions are taken, trauma of the parts can be minimised, both in natural and assisted deliveries. Bruising of the parts, particularly of the vagina, lacerations of the cervix, injuries to the vaginal mucous membrane about the fornices and irregular tears of the perineum, add to the risks of infection. Perineal tears which extend into the rectum are particularly dangerous because of the increased possibilities of faecal infection of the vaginal tract. It is to avoid these that a lateral episiotomy is sometimes indicated. When tears do occur, it is essential that they should be properly repaired immediately after delivery.

Another important condition to be borne in mind is the necessity for preventing devitalisation of the soft parts. This particularly occurs in cases of prolonged labour, and especially in cases where the cephalic pole is allowed to lie in the pelvic cavity for a long time. We have advocated that if the presenting part is in the pelvic cavity for some time and the cervix is fully dilated, no object is gained by leaving it there and delaying interference till signs of foetal distress manifest themselves ; on the other hand, the prolonged pressure of the presenting part on the pelvic soft structures is bound to devitalise them and lead to necrosis and formation of fistulous tracts between the vagina and the bladder or rectum, as well as rendering them more easily liable to septic infection.

In the course of operative deliveries great care must be taken to see that manipulations are performed gently and skillfully, rough handling being avoided. In this respect we must express the opinion that the forceps, which is one of the most useful and beneficent of obstetric instruments may, in the hands of those not perfectly versed in the technique, prove to be the most dangerous of instruments. In the application of the blades of the forceps, in the locking of the forceps, and in traction, great care must be exercised to prevent bruising. Occasionally the forceps tends to slip, and the obstetrician should immediately realise that this is likely to lead to extensive lacerations of the vaginal wall and stop traction. It is also necessary to see that in traction with forceps the head does not emerge from the vagina too suddenly, as it sometimes does, in imperfectly rotated occipito-posterior positions.

Intra-uterine manipulations, when necessitated, should be done with great care. Manual removal of the placenta has always been a matter of grave anxiety to obstetricians, and quite justifiably so.

The Place of Domiciliary and Institutional Midwifery and the Organisation of a Maternity Unit in the Prophylaxis of Puerperal Infection. An important point to realise is that in cases of

complicated labour, particularly where operative interference is required, it is a matter for serious consideration whether the patient should be delivered in her own house or in a maternity institution. There is no doubt that much will depend upon the surroundings; but unless one is perfectly satisfied that conditions closely approximating to those obtained in a well-equipped maternity institution are available in the home, it is not safe to conduct operative deliveries in the house. On the other hand, it must be confessed that a maternity institution itself may be a grave risk unless efficiently run. Those in charge of these institutions should see that every little detail is properly attended to, to prevent the possibilities of puerperal infection. It is unfortunate that even at the present day occasional epidemics of puerperal infection occur in maternity hospitals.

The organisation of a puerperal unit requires much care and forethought. In a well-equipped maternity institution there should be provision for delivering and treating separately during the puerperium cases which are perfectly clean and have not been exposed to any risk of infection. A separate unit should be available for delivering and treating all suspect or frankly septic cases. It would be well if only "booked" cases, that is which have been registered and have been regularly attending the antenatal clinic attached to the institution were admitted into the "clean" delivery wards. There should be separate rooms for receiving the patient for examination. After the preliminary examination, the patient should have a bath, should put on clean clothing and then be taken into the waiting ward for cases early in labour. So far as the actual delivery itself is concerned, our practice is to take these cases on to the delivery boards at a late stage in labour, and after delivering them there, remove them to a recovery ward or sometimes, after two to four hours, to the puerperal wards, if there be no complications.

We have for several years now had attached to these delivery wards a separate operative delivery room, into which every patient who requires operative interference is wheeled. This operative delivery room is equipped just like a surgical operating theatre, and is always ready to receive emergencies, so that there is no necessity for any hurry in the preparation of the theatre, the instruments, or the dressings, etc. We think it is a fundamental mistake to attempt operative deliveries in rooms where normal deliveries generally take place, and one of the ways by which the incidence of puerperal sepsis can be reduced is by having a separate operative delivery room for clean cases, while in the ordinary delivery rooms only spontaneous deliveries occur. It is true that

occasionally after delivery a case may require some active interference, for example, to control postpartum hæmorrhage; but such cases are few and far between and do not seriously undermine our contention that the safest place for a woman who requires assistance during labour is a separate operative delivery room, closely attached to the main delivery rooms.

The delivery rooms should be in charge of a competent midwife who should have a sufficient number of assistants to permit of a nurse with good obstetric training being present at every delivery. There should be one or more house surgeons who do not handle septic or suspect cases, always available for service in the delivery rooms. Rules for the delivery rooms should be formulated and posted, and the detailed arrangements with regard to aseptic and antiseptic care to be followed in the labour ward should be carefully thought out and rigorously enforced.

In the "clean" puerperal wards we would advocate the desirability of separating, as far as possible, operative deliveries from normal labours. The chances of infection are increased when normal labours and operative deliveries are kept side by side, for in the early days of the puerperium it is impossible to say with any degree of certainty if an artificially delivered case may not show a slight or more severe degree of infection. For this reason it would appear a preferable plan to divide the puerperal wards for clean cases into two sections: one which receives the normal cases and the other which receives the operative delivery cases. In large maternity institutions it may be possible to have a third puerperal ward where cases with some previous disease complicating pregnancy and labour may be kept separately, such as cases of toxæmias of pregnancy, accidental hæmorrhage, anæmia and febrile conditions unassociated with genital sepsis, etc.

On the occurrence of infection in any of these wards the patient should be immediately transferred to a separate pavilion, earmarked for the treatment of suspect or septic puerperal cases. It is only by a very careful watch over all these factors that the incidence and spread of puerperal infection can be materially reduced.

The Suspect and Septic Cases. We have already referred to the fact that these cases should be separately treated. They should be delivered in a separate pavilion of the hospital, and it is desirable that each such suspect or septic case should be delivered in a separate cubicle, warded off entirely from an adjacent cubicle. Special nurses and house surgeons should be available for the conduct of such cases and such cases alone.

separate theatre should be available so that cases can be wheeled into it and any necessary operative delivery undertaken. After delivery these cases are nursed in special puerperal wards; and it is desirable wherever possible to limit these wards to small units of four to eight beds at a maximum. We prefer separate rooms for some cases; and although the difficulties of nursing are increased by isolation of patients in separate rooms during the puerperium, the advantage is all the greater in that the risk of cross infection is rendered almost negligible. In the puerperal wards attached to this septic section some should be for suspect cases and others for frankly septic cases. All cases from the clean puerperal wards showing any signs of puerperal infection are naturally transferred into the septic puerperal section.

In this connection we should like to refer to a common practice which obtains in most modern institutions of transferring cases of puerperal infection to isolation hospitals. We regret we are unable to understand the rationale of this procedure; for we believe that if a separate pavilion is available, far off from the main puerperal and labour wards, there is no reason why such cases should not be treated in such pavilions. Moreover, the care of an expert obstetrician is needed to a greater degree for such cases, and if these patients are transferred to an infectious diseases hospital it is not always possible to get that amount of care necessary from the point of view of obstetrics. Nor do we feel that cases of puerperal infection are analogous to cases of infectious diseases, such as scarlet fever, small-pox, chicken-pox, etc., and should therefore be transferred to an infectious diseases hospital. At the Government Hospital for Women and Children, Madras, during the last thirty years the practice has been to treat these septic cases in a separate pavilion of the hospital, far removed from the clean puerperal and labour wards, with a separate nursing staff, and we have never known of any epidemic developing therefrom. Much care and constant supervision are undoubtedly required when a separate septic pavilion is attached to a maternity institution.

CURATIVE

It is now becoming generally recognised that the best results in cases of puerperal infection are obtained by doing nothing and by interfering as little as possible with the genital tract. It is, however, necessary to determine the nature of the infection and the extent of its invasion before resorting to the particular line of treatment. It is also essential to know the organism which may have a bearing on the treatment.

thoroughly investigated and suitably treated. We have already referred to the fact that there are a number of other infections that may manifest themselves, and that it is not always puerperal sepsis that is the cause of a febrile condition.

The majority of cases of puerperal infection are fortunately of a mild nature, and it is with these that the best results are obtained. If the patient be properly treated at this stage the chances of the infection spreading are minimised.

Local Treatment. The condition of the perineum should be noted; if there are any signs of inflammation or marked cedema in a perineum that has been sutured, it is desirable to remove the sutures and lay open the wound to favour free drainage. The vagina should be carefully examined, and if there are any puerperal ulcers they should be touched with a suitable antiseptic such as mercurochrome, iodised phenol, izal, tincture benzion co., etc. Hot vaginal douches are given twice daily to clean the vagina and the cervix to favour separation of sloughs and promote uterine contractions. A large number of antiseptic solutions have been suggested, but it is the mechanical factor in the douching rather than the antiseptic property of the fluid that counts. If the lochia is offensive, irrigations with eusol or iodine solution (1 drachm to 1 pint) are preferable, otherwise an ordinary saline douche (1 drachm to 1 pint) will suffice. The douche should be given with the following precautions: the douche-can should not be held too high, the temperature of the fluid should be between 115° to 120° F., the douche water should be sprayed into the vagina and should not pass into the cervical canal, and it should escape freely from the vaginal cavity. In the majority of cases these simple measures, combined with elevation of the head of the bed to favour free uterine and vaginal drainage and the administration of ecbolics to stimulate uterine contraction and involution, will be found sufficient to bring down the temperature and to promote convalescence. A common ecboic preparation given is a mixture of liquid extract of ergot, 10 to 15 minims, and quinine bihydrochloride, 2 to 3 grains per dose, thrice daily. The temperature usually comes down in three or four days, the lochia changes in colour and becomes more healthy, the uterus involutes rapidly, the puerperal ulcers tend to heal, and the general condition is greatly improved. The patient's appetite returns gradually and she sleeps better, so that medication may be gradually discontinued.

Special Methods of Local Treatment. Besides the measures that have been described many others have been advocated, some of which are desirable, while others are positively harmful and should be avoided. The following are some of these methods:

Remington-Hobbs' Treatment. Hobbs recommended the injection of sterile glycerine into the uterus with a view to promote a free flow of lymph so as to obtain its bactericidal effect on the organisms. For this purpose the patient should be placed on the operating table, the genitalia properly cleaned and the vagina douched and swabbed with some antiseptic; after the cervical os has been carefully cleaned a soft rubber catheter is passed by sight into the uterus and two to three ounces of glycerine injected through it. The rubber catheter may be left in the uterine cavity and the glycerine injected periodically. It has been claimed that this method of glycerine drainage has resulted in the clearing up of the local infection within a short period. Hobbs' method has produced favourable results in local uterine infections, but where the infection has spread into the pelvic cellular tissue or the tubes and ovaries, other lines of treatment are indicated.

The Carrel-Dakin Method. This method came into vogue during the Great War I following the experience of treatment of wound infections. This consists in continuous disinfection with hypochlorite solution. A series of rubber tubes are passed into the vaginal cavity at different levels and connected with a long glass tube through which the hypochlorite solution flows, so that there is a continuous irrigation of the vagina.

The method has not proved to be of much value and has now few supporters.

Intra-uterine Douching. Intra-uterine douching with an antiseptic solution or with normal saline was recommended as a method of washing out the uterus and so preventing the accumulation of foul discharge. It came to be realised, however, that this method of treatment was attended with some risks. It does not achieve the purpose intended because—

- (1) The douche has no effect upon the bacteria which have already gained admission into the deeper layers of the endometrium or the musculature.
- (2) The intra-uterine douche induces a severe reaction and the patient generally develops a rigor with hyperpyrexia soon after it has been given.
- (3) Not infrequently the douche, far from removing the septic material, disseminates it either through the open sinuses or even through the uterine ends of the Fallopian tubes.
- (4) Air embolism is by no means a remote danger.
- (5) If carelessly given the uterine wall, which is diseased, may be injured.

- (6) Lastly, sudden death has sometimes occurred after such a douche.

It is several years now since we gave up this practice, and it must be confessed that our results have been far more encouraging.

Curettage. If intra-uterine douching is not a safe procedure, curettage is even more risky. The dangers of curettage are many and there is little or no advantage in this operation. It is difficult effectively to curette the puerperal uterus so as to remove all the diseased endometrium; but even if this can be done it should be realised that curettage does not in any way affect the bacterial layer which, as has been stated, may be in the musculature of the uterus. Far from removing the bacteria, the curettage may remove the protective layer of leucocytes and thus help in the rapid dissemination of infection into the general blood stream. Perforation of the uterus is not an uncommon occurrence, while the possibilities of spread of infection through the Fallopian tubes or into the cellular tissue are by no means negligible. Curettage is therefore condemned and has no place in the treatment of puerperal infection.

The milder form of curettage with the fingers is equally unnecessary and undesirable, save in those extreme cases where secondary hæmorrhage occurs, the hæmorrhage being the result of a placental polypus or some pieces of retained placenta or membranes.

Touching the inside of the uterus with some antiseptics was a favoured method of treatment at one time. It was in the hope that the antiseptic would effectively destroy the micro-organisms in the uterine cavity. That hope has not been realised, and it is now more clearly understood that such interference with the uterine cavity is harmful in view of the possibilities of introducing additional organisms and destroying the leucocytic barrier layer.

Treatment of Lochiometra. Occasionally in mild infections the uterus may be found retrodisplaced and distended with retained lochia. This is known as lochiometra. If this becomes infected it is converted into a pyometra. It is necessary to favour drainage which is effected in the majority of cases by vaginal douches, postural methods such as replacing the uterus in an anteverted position, and nursing in the Fowler position, as well as by cathartics. Occasionally it may be necessary to empty the uterus by passing a double channelled catheter or a Budin's tube. This is merely to evacuate the contents of the uterus, and if it is fully done with proper antiseptic precautions it should not

It will be clear from what has been stated above that there is little advantage to be gained by interfering with the generative tract, and particularly that all intra-uterine manipulations should be strictly avoided in the treatment of this condition. We are convinced that in spite of all precautions that may be taken, any form of intra-uterine manipulation is attended with risk and is more likely to exacerbate the condition than relieve it. Except in cases complicated by secondary hæmorrhage or lochiometra, we have entirely given up this procedure.

Even so far as local treatment is concerned we have limited it to the minimum extent possible.

The *cod-liver oil method of treatment* in local infections. This consists in soaking a piece of sterilised gauze in pure, fresh cod-liver oil and inserting it with proper precautions into the vaginal cavity. The gauze is kept in for periods of from twenty-four to forty-eight hours. The patient is treated on the general lines already suggested for local infection, except that no vaginal douches are given. We have found this method of treatment exceedingly useful in cases of mild infection associated with lacerations of the vagina or cervix. The sloughs separate and the cervix and vagina present a healthy appearance in the course of forty-eight to seventy-two hours. A great advantage in this method of treatment in local infection is that frequent vaginal manipulations or douches are not necessary, and that the obstetrician can himself, with due precaution, introduce the gauze and remove it at intervals of from twenty-four to forty-eight hours.

Whatever may be said as to the value of vaginal irrigation, it must be realised that in careless hands it constitutes a source of danger, not to speak of the inconvenience that is experienced by the patient by repeated douching during the twenty-four hours. The cod-liver oil gauze method of treatment, which has been so successfully adopted in surgical cases, has in our opinion a very definite place in the treatment of puerperal infection, particularly in cases associated with large tears of the cervix, vagina, perineum or of the fornices, with involvement of the cellular tissue, and is well worth a trial.

General Treatment. The general condition of the patient should be maintained. Fresh air, good light, plenty of sunshine if possible, light and nutritious diet and the promotion of sleep are important. Physical and mental rest is the essence of good treatment. Visitors should be limited at least till the patient is definitely improved. It is better to stop nursing the child for a few days, and in such cases have the child nursed by another breast, or not breast-fed at all.

sponging of the extremities, an ice-bag to the head and mild diaphoretics are useful. Strong antipyretics are better avoided in view of the subsequent depression.

The Bowels. Mild laxatives are usually necessary to keep the bowels open. A troublesome complication in some cases is diarrhoea, and is more dangerous in cases where perineal lacerations of an extensive nature are present. It is here that careful nursing is essential, to see that the parts are cleaned properly after each evacuation. If the diarrhoea is persistent, small doses of bismuth and pulvis creta aromaticus may be necessary, or a starch and opium enema is occasionally useful. In cases of vomiting, particular care should be taken to see if it is a sign of commencing peritonitis. Distension of the intestines may sometimes prove troublesome. Turpentine enemata, mag. sulph. in divided doses of a drachm each, eserine salicylate (1/100 grain) and pituitrin ($\frac{1}{4}$ c.c.) may be given and repeated if necessary. The rectal tube, passed high, is sometimes of value.

Diet. The diet should be light and nutritious and generally liquid. Milk, buttermilk, conjees, fruit-juice and soft gruel may be given. The diet should be regulated according to previous habits of the patient. There is no reason why in the tropics the patient accustomed to rice diet should not be given soft-boiled rice in a semi-liquid form. If the condition improves semi-solids may be given. Glucose can be given freely with fruit juice. Formerly alcohol was used in large quantities. This has now been found to be quite unnecessary, but occasionally a small dose may be beneficial for procuring sleep and for those accustomed to its use.

Vitamin Therapy. We have already referred to the part played by the anti-infective vitamin—vitamin A—in the prophylaxis of puerperal infection. We should like to state now that in many cases, particularly of mild infections, the administration of vitamin A is distinctly beneficial to the patient. Preparations which contain concentrated doses of vitamins A and D have been given in such cases with beneficent results.

Specific Treatment. Many specific treatments have been advocated from time to time, but experience has shown that the majority of these are neither indicated nor beneficial. Of these may be mentioned:—

Serum and Vaccine Therapy. A considerable amount of controversy is still raging round the question of the value of sera and vaccines in puerperal infection. It would appear from the experience of many observers that serum has a place in the prophylactic treatment of puerperal infection. We should like to state that

infection has actually occurred serum is of doubtful value. As a prophylactic it should be given in all cases of operative delivery, particularly if there is the remotest suspicion of the possibility of infection. Cases handled outside the hospital or by untrained midwives, or cases which show evidence of intrapartum infection, should be given as soon as delivery is over, an injection of 30 to 50 c.c. of antistreptococcal serum hypodermically. The dose may be repeated and no more than three doses need be given. Care should be taken to watch for signs of anaphylaxis.

Vaccine therapy has also been tried. There are two ways in which vaccine therapy might be utilised:—

(1) As a prophylactic, vaccine therapy has been given in the last weeks of pregnancy or immediately after labour. A polyvalent combined vaccine prepared from a number of strains of puerperal streptococci or staphylococci has been used for this purpose.

(2) An autovaccine has also been tried. The difficulties in regard to autovaccine are twofold: (a) it takes time to prepare an autovaccine, and in cases of generalised infection where the disease takes an acute course, the vaccine is not available in time; (b) it is difficult to determine the particular organism that is the cause of the infection, and therefore an autovaccine may prove ineffective. On the whole, both the serum and vaccine therapies have not reached levels of expectation.

Protein-shock Therapy. This has a limited place in certain types of puerperal infection. We do not think that protein therapy is of any use in the acute infective stage. On the other hand, in the chronic type of cases where a pelvic cellulitis or a thrombophlebitis persists, it is of use.

This is generally done by giving injections of sterilised defatted milk. The dose may vary from 1 to 5 c.c. We do not think that large doses are needed, as a small reaction is quite sufficient to bring about the desired result. The foreign protein stimulates the natural immunising functions of the body, especially the reticulo-endothelial system.

Chemo-therapy. A large number of chemical substances have been used intravenously in the treatment of puerperal infection. Among these may be mentioned preparations of arsenic and mercury, such as salvarsan, colloidal silver salts such as collargol, mercurochrome, neutral iodine, gentian violet, eusol, and it seems to us that particular care should be taken in the intravenous injection of any of these chemical substances in the puerperium. Excepting injections of neutral iodine in suitable cases the other chemicals have not proved of much use.

As a result of the work done by Domagk in Germany in 1935, Levaditi and Vasiman in France, Colebrook and Kenny in Great Britain and later by others, the sulphanilamide groups of drugs as specific therapeutic agents against Hæmolytic Streptococcal infection have been introduced of late and are now known to be of particular value in the treatment of puerperal sepsis. Prontosil and Prontosil soluble were used in the beginning and then came in the sulphanilamide groups. Sulphanilamide is the name generally used for p-aminobenzene sulphonamide. This is available now under different trade names such as sulfanilamide, streptocide, Sulphonamide. These were found to have certain amount of toxicity when used in large doses and hence with the help of chemists, other preparations more potent but less toxic were introduced. Of these, the p-amino Benzene Sulphamido-Pyridine i.e. M & B 693 is the earliest. Then came in Sulphathiozole, the alternative name being Thiazamide and M & B 760 which acts more powerfully not only on the streptococci but on the staphylococci as well.

It is less toxic but is very quickly eliminated from the system. A more recently introduced product is Sulphadiazine which is equally strong but less toxic.

All these drugs are bacteriostatic mainly although bactericidal to a small extent. They interfere with the metabolism of the bacterial cell so that it is starved of some substance it requires for its growth.

Dosage—one gram three times a day was given for mild cases and twice that dose for severe cases till temperature fell and then the dose was reduced. This led to toxic effects on prolonged administration and an immunity to the drug was established. The accepted dosage at present is 8 grams for 1st day, 6 grams on the 2nd day, 4 grams on the 3rd day and 4th day. If no improvement, stop the treatment and adopt some other therapy. Continue this lowered dose for a week in cases where thereapy is successful. Even with small doses, sometimes toxic symptoms manifest themselves. These toxic effects are cyanosis with sulphhæmoglobinæmia and methhæmoglobinuria, gastrointestinal upset with vomiting, agranulocytosis, acute anæmia, toxic liver damage with jaundice, puerperal neuritis, drug fever, and general symptoms like depression, headache, dizziness, paræsthesia and drowsiness.

If any of these symptoms arise, stop the therapy and give large doses of Vit. B. by mouth or as injections. Agranulocytosis and anæmia must be prevented by repeated blood examination during the course of treatment, these being the most serious all toxic effects.

Recently Pencillin has been introduced into the treatment of streptococcal infections and is still under trial. The quantity available for civilian use being limited, its efficacy in the treatment of puerperal sepsis is still sub-judice. Perhaps, it is of value in cases where infection is severe and there is no response to therapy by the sulpha group of drugs.

Transfusion. To supply the patient with the proper antibodies, blood has been transfused from suitable donors. The blood of a convalescent puerperal woman has been used in the hope that in such a blood the antibodies will be at their maximum. In some cases a stimulant injection of vaccine has been given, 500 to 1000 millions to the donor, and the blood drawn four to eight hours later and injected into the recipient. On the whole it cannot be said that the results of such immuno-transfusion have been very satisfactory. But blood transfusion in cases where the patient is very anæmic is beneficial in effecting a rapid recovery by improving her general resistance to infection.

Injections of Saline. To maintain the general health of the patient and also to dilute the toxins, saline has sometimes been given by the drip method per rectum, sometimes subcutaneously, and sometimes with glucose intravenously.

Counter-irritants. This method of treatment would appear to me more favoured by the French school of obstetrics. It consists in producing what is known as an abscess of fixation. Injections of turpentine, 10 to 20 c.c., deep into the thigh or in the gluteal region, in order to produce an abscess and thus favour a leucocytosis, have been tried in several cases. For a similar reason injections of nuclein may sometimes be given.

Surgical Measures. In view of the desperate nature of the condition in some cases, attention has naturally been directed to the possibilities of surgical methods of treatment; but experience shows that such methods have not proved as beneficial as they were at one time expected to be. This is not surprising, as in the majority of cases these desperate measures have to be undertaken either at too early a stage when they may be quite unnecessary, or at such a late stage that they are quite useless.

Among the surgical methods advocated are hysterectomy and ligation of pelvic veins.

A hysterectomy is carried out in the puerperium for certain conditions such as a ruptured uterus, a degenerating fibroid complicating the puerperium, cancer of the cervix, some cases of molar pregnancy, in cases of placenta accreta, or in certain cases of inverted infected uterus. Hysterectomy as a method of treatment in septicæmia has proved useless. In cases which have recovered

it is doubtful whether the operation was necessary; in cases that have died the inference may be drawn that the operation should have been done at an earlier stage. As a practical measure, therefore, it has little or no place in the treatment of puerperal infection.

Ligation of Pelvic Veins. Following on the analogy of the control of infection in cases of lateral sinus thrombosis, it was suggested that if some of the veins responsible for spread of the infection were also ligated such dissemination might be controlled. The veins which may be ligated are the ovarian, the internal iliac and the common iliac veins. The technique of the operation is comparatively simple. The usual method adopted is the extra-peritoneal route. But the difficulty lies in making an accurate pre-operative diagnosis as to whether any veins are thrombosed, and if so, which of them?

On the whole it may be said that the results of operative measures so far have not been encouraging and cannot be said to constitute any definite advance in the treatment of puerperal infection.

Operations such as colpotomy in cases of pelvic abscess, and laparotomy and drainage in cases of peritonitis are, however, useful for the complications arising in cases of puerperal sepsis, though the latter is now rarely resorted to after the advent of sulphadiazine therapy.

COMPLICATIONS

Several complications may occur in the course of puerperal infection which may aggravate the condition. They must be carefully watched for, and when definite signs and symptoms are present suitable treatment should be adopted:

Among these complications may be mentioned:—

- (1) General peritonitis.
- (2) Pelvic cellulitis.
- (3) Salpingitis and oöphoritis.
- (4) Pyæmic abscesses.
- (5) Infection of the urinary tract.
- (6) Phlebitis—phlegmasia alba dolens.
- (7) Puerperal psychosis.

Peritonitis

Infection of the general peritoneal cavity may occur at two stages in the course of puerperal infection:—

- (1) Early in the disease on the second or third day.
- (2) Late in the course of infection as a result of extension of pelvic peritonitis.

The onset of peritonitis must be watched for carefully. It occurs on the second or third day after delivery, and the signs and symptoms vary so considerably that they may sometimes escape attention. In cases which develop the condition within the first three or four days after parturition the patient is nearly always already acutely ill with puerperal fever. The onset of peritonitis is marked by a change for the worse in the general condition. The onset in the early stages is insidious. A rigor may sometimes occur, the pulse is rapid, and its tension low; a certain amount of pain and vague discomfort may be felt in the region of the umbilicus; occasionally, a profuse diarrhoea may set in. The physical signs referable to the abdomen are few and difficult to interpret. Distension of the lower part of the abdomen is one of the earliest and most important sign. Gradually the distention increases until just before death the abdomen may be very tense. There is almost always tenderness, particularly in the hypogastric and iliac regions. Rigidity of the abdomen is not usually present, and this sometimes accounts for failing to diagnose the condition. Signs of free fluid in the abdomen are present in advanced cases, but by the time these are found the prognosis is usually hopeless. Careful watch must be kept hour after hour, and the decision to operate must be taken at a very early stage before any pronounced physical signs or symptoms manifest themselves. Unless the patient is operated on within a few hours after the onset of peritonitis the prognosis is unfavourable. From limited experience, one can say Penicillin Therapy is invaluable in these cases and has replaced surgical interference.

Signs and Symptoms of Peritonitis developing at a Later Stage in the Puerperium. In such cases the peritonitis develops several days after delivery and often there are local foci of suppuration in the pelvis. Clinical evidence will therefore be available of puerperal infection and involvement of some of the pelvic structures. Typically the onset of puerperal peritonitis is signalled by three symptoms: a rigor, abdominal pain and greatly increased pulse rate. They form a characteristic triad whose importance can never be ignored. Abdominal pain usually accompanies the initial rigor, and in almost every case it is severe, sometimes even agonising. The pain is continuous in character, but sometimes it occurs in severe intermittent spasms, causing the patient to suffer badly. The initial pain may be referred to the umbilical or the hypogastric regions, but as the infection spreads it becomes more generalised. The pain persists for two to three days with varying severity, but later it assumes a stabbing character, exacerbated by the slightest movement of the body.

Synchronously with the rigor the pulse rate rises to 120 or above and remains rapid even after the temperature has fallen. A persistently high pulse rate is one of the most significant of clinical signs. Respirations are increased in rate; the appetite is lost; vomiting is not a constant feature; the bowels are usually constipated, but in some cases diarrhœa is an important early symptom. Painful micturition and not uncommonly actual retention of urine have been noted. The patient appears seriously ill, and very soon after the onset of the condition the face wears an anxious expression; the eyes are sunken and the cheeks are hollow; she lies flat on her back or side with her legs drawn up and is quite still. The tongue is coated and later becomes dry. If the patient is examined after the initial rigor and the early pain, rigidity can always be detected. Tenderness of the abdomen is generally noticed, the most tender regions being the hypogastric and iliac regions. Together with tenderness there may be distension of the abdomen. *Per vaginam*, tenderness of the pouch of Douglas may be elicited.

Diagnosis. It is very important to make an early diagnosis of this condition, but unfortunately neither the signs nor symptoms are definite. A gradual but persistent or sudden change for the worse in the general condition of the patient, a pulse rate over 120, diarrhœa, progressive distension of the abdomen, abdominal pain and tenderness whether generalised or local, and rigidity of the abdominal wall, are all signs to be taken into account in arriving at a diagnosis. Occasionally mistakes are made; but it is preferable to err on the safe side than to neglect taking active measures till the condition has manifested itself so definitely that little can be done at that stage to relieve the patient.

Treatment. It is now generally recognised that the proper treatment for general puerperal peritonitis is to operate. The points to be taken into consideration are:—

- (1) The time to operate.
- (2) The anæsthetic.
- (3) The nature of the operation.
- (4) Treatment of the causative factors responsible.
- (5) Accessory treatment.

The Time to Operate. As soon as a definite diagnosis has been made, an immediate operation must be performed. While it is an advantage to perform it in an operating theatre, in the worst cases the patient need not be shifted and the operation can be done at the bedside.

This is in contrast to cases of localised pelvic peritonitis where to begin with the treatment should be on conservative lines.

as frequently the inflammation will settle down, particularly if it is associated with a definite localised and palpable lesion, either in the uterine appendages or in the broad ligament. In these cases the obstetrician must always be on the watch for possible spread of the infection to the general peritoneal cavity when immediate operation is indicated.

The Anæsthetic. A local anæsthetic is the best as very little internal manipulation is required. Failing this, gas and oxygen or ether may be given.

Nature of Operation. The main aim of the operation is to drain the peritoneal cavity. In every case the drainage should be by the abdominal route, as adequate drainage of the peritoneal cavity cannot be obtained by the vaginal route. The abdomen is opened through a left paramedian incision below the umbilicus. As soon as the peritoneum is opened there is in most cases an escape of thin purulent fluid. A drainage tube is then inserted and the abdomen closed. The drainage tube should be gradually shortened daily and removed as soon as the drainage has ceased.

Accessory Treatment. After the operation glucose saline is given. Salin may be given subcutaneously or intravenously. The patient is placed in Flower's position and carefully nursed and chemotherapy is continued.

Treatment of the Cause of Peritonitis. In cases where definite foci of suppuration are present, particularly in the late cases of peritonitis, an attempt may be made to remove such foci. Gangrenous or suppurating tubes and ovaries may have to be removed. It is better, however, in all such cases to limit the amount of interference to the minimum, and mere drainage is more effective in the initial stages of the severer types of puerperal peritonitis, leaving the septic focus responsible to be dealt with at a later stage.

The general condition of the patient should be improved, light nutritious diet given, careful nursing and efficient stimulant treatment with free evacuation of the bowels adopted. Glucose and brandy, chicken essence and fruit juice are beneficial.

Pelvic Cellulitis

Not infrequently pelvic cellulitis may occur as a complication in the course of puerperal infection. It may be acute, subacute or chronic.

In the acute cases complete rest, hot vaginal douches, sometimes hot bowel washes, together with turpentine stupes or antipallogistine applied to the lower abdomen may be useful. In

the more chronic cases protein-shock therapy is desirable. Skimmed milk or aolan intramuscularly, 2 to 5 c.c., three times a week may be useful. The condition must be closely watched, and if there is any definite abscess formation it must be opened and drained. Usually this is done through the vaginal route. In some cases where the abscess points above Poupart's ligament an incision at the site where it points may be necessary. General supporting treatment to keep up the patient's strength must be adopted.

Salpingitis and Oöphoritis

In the majority of cases, where these complications develop, rest, douches, tampons, etc., are sufficient to resolve the inflammation. Occasionally, however, a pyosalpinx or a tuboovarian abscess forms. Care must be taken to see that the inflammation is localised before active interference is attempted. As in most of these cases it is associated with inflammation of the pelvic cellular tissue the same treatment that has been suggested for pelvic cellulitis may have to be adopted. After some months, if there is still definite evidence that the tubes are involved, operative treatment may be necessary. This consists in opening the abdomen, separating the adhesions and removing the diseased tube.

We must here sound a note of warning against any active interference in cases of puerperal salpingitis at a stage when the infection has not yet definitely localised or become chronic. Removal of inflamed tubes and ovaries too soon after the acute phase is definitely contraindicated, as the infection may spread and a virulent general peritonitis result. For this reason even though there may be definite signs of adhesions, chronic salpingitis with a pyosalpinx or a tubo-ovarian abscess, we do not recommend early operative interference. Conservative methods of treatment should be adopted in the meanwhile: rest, douches, tampons, injections of skimmed milk or aolan and supporting treatment for the patient's general health are indicated. Physiotherapy is beneficial in some cases.

Pyæmic Abscesses

These may develop in any situation, generally in the soft tissues or in the joints. Wherever possible the abscess should be opened and drained, and when an empyema or an abscess in a joint forms it should be aspirated. The patient's strength must be supported, and if an autovaccine can be prepared and given it may be useful.

Urinary Infections

The urinary tract is sometimes affected. Very often it is due to *B. coli*. Cystitis, pyelitis and pyelonephritis may occur. It is important to realise that care should be taken in the emptying of the bladder; that catheterisation should be avoided as far as possible; and where necessary it should be limited to a minimum, and where there is any ulceration or laceration about the urethra, particular care should be taken.

If in spite of this infection occurs, urinary antiseptics should be given. Alkaline diuretics or hexamine and acid phosphoric dilutum are indicated. Cytotropine intramuscularly has been found beneficial, and in the more persistent cases preparations of mandelic acid may be given. Treatment of urinary infection by sulphonamides is exceedingly satisfactory and is done as a rule now-a-days.

Not infrequently a woman who has had pyelitis during pregnancy suffers from a recurrence of the symptoms after delivery.

Phlegmasia Alba Dolens

This is the term applied to the condition where, as a result of thrombosis of the femoral and iliac veins, there is oedema of the extremity; it is associated with fever and pain. The disease usually begins late in the puerperium, generally after the eighth or tenth day. The initial symptom may be excessive pain in the extremity. The swelling is first noticed in the groin and upper thigh. Within a few hours or days the whole limb may be involved. Sometimes both limbs may be affected. Sometimes the phlegmasia is the result of extension of the cellulitis from the pelvis.

Treatment. Prophylactic treatment consists in avoiding all possibilities of septic infection. The great danger of phlebitis and thrombosis is embolism. The patient should be kept at absolute rest and the affected limb should be slightly elevated and immobilised between sand-bags or pillows to prevent any pressure or movement. For the pain morphia may be necessary. Local applications are sometimes of benefit. The limb may be painted with pigment belladonna or ichthyol and glycerine, covered with cotton-wool and lightly bandaged. Particular care should be taken to see that bed-sores do not develop. The bowels should be kept free, but no active purgation is indicated. Good nursing is of great importance. The strength of the patient should be supported. Anæmia if present should be actively treated. The patient should be kept completely at rest for some weeks until the swelling has

disappeared and the temperature has remained normal for two to three weeks. The patient may then be given a little more freedom, being allowed at first to sit up in bed and then gradually to get about. Massage of the limb should never be undertaken. The risk lies in the possibility of displacement of the thrombi, resulting in pulmonary embolism.

Inflammatory Affections of the Breast

These are not infrequent in puerperal women, especially in anæmic and weak women, and usually result from a cracked nipple through which pyogenic organisms find their way into the lymphatics or acini of the breast substance. If through the lymphatics the inflammation is mainly interstitial in character, the pus diffusing itself widely between the lobules. In the other variety the pus is primarily intra-alveolar.

Signs and Symptoms. The breast becomes swollen, acutely painful and tender. The gland lobules are enlarged and indurated, and if suppuration is progressing, lactation is to some extent impaired. Owing to the inability of the mother to allow the child to be nursed, considerable tension results from accumulation of milk. If suppuration follows, the skin over the breast becomes red and cedematous, and according to the situation of the pus three different forms of abscess may result:—

- (i) Supramammary abscess, where the pus collects in the subcutaneous tissue or beneath the nipple. It is often unconnected with the breast proper and comes readily to the surface.
- (ii) Intramammary abscess. This is the commonest variety, the pus developing within and distending the lobules. It may sometimes produce gangrene of the glandular tissue.
- (iii) A submammary abscess may form in the cellular tissue beneath the breast.

Treatment of simple acute mastitis consists in supporting the inflamed gland by means of a sling or bandage and binding the arm to the sides; fomentations are applied; any tension due to retained secretion of milk is relieved by the breast pump; bowels are opened and the patient placed on a light nutritious diet. If the condition subsides, belladonna ointment may be painted on as it often helps in the resolution. If, however, the part remains hard and swollen, with severe pain and temperature, suppuration is obviously threatening. One should not wait for the appearance

of fluctuation before opening an abscess, as in some cases a great deal of the breast substance is destroyed before any distinct fluctuation can be appreciated. Persistent oedema under such circumstances is quite a sufficient indication to warrant operation. In the supramammary variety it matters little in which direction the incision is made, since the pus is always superficial to the breast tissue. In the true intramammary abscess the incisions should radiate from the nipple. One or more may be needed and these should be freely made so as to allow of the insertion of a finger to open up any pockets or lobules which are distended with suppurating material. A drainage tube is inserted for a time and gradually shortened. When the chief incision is needed above the nipple, it is wise to make a counter-opening in the lower half of the breast and generally on the outer side to permit of efficient drainage. A submammary abscess is best opened towards the lower and outer side and also at any spot where pus points.

Not infrequently inflammation of the breast is due to the unskilful administration of saline subcutaneously. If the saline is given too hot or is allowed to flow into the breast substance, instead of into submammary tissues, the breast becomes inflamed, suppurates, large sloughs may form, and in severe cases the whole of the breast substance may be involved in a gangrenous inflammation. It is necessary, therefore, to be cautious in the administration of submammary saline, to see that it is given underneath the breast into the loose areolar tissue. The saline should be properly sterilised, or at least boiled water should be used in the preparation of the solution in cases of emergency, and the temperature of the solution should be carefully regulated.

Reproductive Insanity

Mental disturbances of varying degrees are not uncommon during the course of pregnancy, labour, the puerperium and lactation. Some of the minor degrees of mental change have been referred to under the signs and symptoms of pregnancy. But it not occasionally happens that a pronounced psychosis develops during the reproductive period.

There are four stages at which this may occur :—

(1) In some patients melancholia develops during pregnancy. It may occur either in the first trimester, but more often appears in the third trimester of pregnancy. The stress and strain involved by pregnancy, and especially the added mental distress of illegitimacy, or more rarely when a posthumous offspring is expected, may be responsible for mental derangement.

(2) During labour, neurotic women in particular break down under the strain and develop maniacal symptoms. Transitory mental excitement, almost amounting to mania, is not infrequent at this stage.

(3) The most common period, however, for mental instability to be noted is during the puerperium. Early in the puerperium patients are more inclined to develop the maniacal forms of insanity, while later on the melancholic type predominates. During an attack of mania, homicidal tendencies, particularly infanticidal, may be observed, whereas when melancholia develops suicide is not infrequent.

(4) Lactational insanity is more often of the melancholic type. It persists for a few months. Not infrequently a patient who once had psychosis during pregnancy or the puerperium develops the same tendency at subsequent pregnancies, and if child-bearing is not prevented the patient may ultimately become permanently deranged.

Causes. In addition to the causes mentioned above, the commonest underlying aetiological factors are the toxæmias and infection. In fact in many cases of toxæmias of pregnancy, particularly those followed by eclampsia, some degree of psychosis invariably results. Fortunately the period of mania usually lasts for a short time only, but in some it is more pronounced and of longer duration. In cases where septic complications follow, puerperal mania is not infrequent.

Apart from these two factors, namely, toxæmia and infection, a few cases are of idiopathic origin. In some, particularly the idiopathic type, hereditary influence plays a part. Such need not necessarily be the more pronounced forms of insanity, but varies from mere eccentricity to neurotic tendencies. In the psychosis that develops in septic cases, excitement with hallucinations accompanied by physical movements and homicidal tendencies may be observed. Later the patient passes into a condition of mental depression, during which suicidal proclivities dominate.

Signs and Symptoms. Among the symptoms noted may be sleeplessness—which is an early symptom—restlessness, incoherent talk, delusions and hallucinations, together with an excited look, a tendency to discard clothes and a lack of the reserve that is generally observed in women. The maniacal symptoms may be so pronounced that the patient has to be controlled in bed by delirium sheet. Usually the patient refuses food, is dirty and unclean in her habits. Elevation of temperature may be observed where a septic factor is responsible, the temperature is produced due to the infection; but in others in the early stages of mania

excitement, temperatures varying between 99° and 101° are not infrequent. The pulse is also proportionately rapid; the tongue may be dry and the patient may exhaust herself to a serious extent.

Prognosis. On the whole the prognosis in puerperal psychosis is favourable. When mania occurs during labour and in eclampsia the outlook is much more favourable than in the other types, recovery usually occurring within a few weeks. Recovery is much more prolonged in cases following infections, and in about a third of these the woman may fail to regain her mental equilibrium. The period of convalescence may last from three to six months. Melancholia following pregnancy and occurring in the lactational period is more recalcitrant. The tendency for a recurrence in a subsequent pregnancy has already been mentioned. The mortality is comparatively low unless the patient dies from the underlying complication, such as infection or toxæmia.

Treatment should be directed to the underlying cause and the mental condition. In cases of infection the immediate objective is to treat this. Administration of sedatives, careful nursing, liberal and nutritious diet, chiefly in the form of fluids and suggestive therapy, are helpful. It is preferable to remove the patient for institutional treatment, and relations and friends should not be allowed to visit her. The proper place for treating these cases in the early stages is a maternity institution. When the psychosis tends to be prolonged and the patient has recovered from all the effects of the puerperium, she can be transferred to the care of a psychiatrist.

APPEN

TRANSF

THE transfusion of blood from the the veins of a patient suffering from due to injury or disease has been value as a life-saving measure in after the Great War.

Indica

The indications for transfusio

(1) Hæmorrhage and Shock.

in shock and hæmorrhage may blood, or failing that by infusion better, by a 6 per cent. solution sodium chloride. In pure shock, the amount of circulating fluid, the body remains unchanged; hence case the infusion of the gum-ac In severe hæmorrhage, however not only of replacing the fluid oxygen carrying red blood corpus.

Though infusion, especially undoubtedly of very great value generally agreed that blood transfusion especially in severe and desperate is often of service in obstetric post partum hæmorrhage, and the severe in case of placenta prævia and various as other cases of severe hæmorrhage.

Transfusion has also been prevention of shock after severe hemorrhage. It should be given towards the close of the signs of shock are marked as prophylactic measures. Where it should be given before the operation as

The effect of transfusion of acute anæmia secondary to hæmorrhage is almost immediate. The coloration previously thready or even in

rate slows and its volume becomes normal. Restlessness diminishes and the patient may have a natural sleep as her general condition improves. These good effects are often permanent; if there is a relapse, a further transfusion may re-establish and even add to the benefit derived from the first.

(2) **Hæmophilia.** In this disease the coagulation time is greatly increased, with the result that a hæmophilic patient may bleed profusely from a trivial wound. In such cases transfusion has been employed with great success. Not only does the transfused blood replace that which has been lost, but the effect of the transfused blood is to diminish the coagulation time, possibly even to normal. Transfusion thus aids in controlling the hæmorrhage. A comparatively small transfusion, 100 c.c. or so, is sufficient to produce such a hæmostatic effect.

(3) **Melæna Neonatorum.** In this disease severe hæmorrhage takes place from the bowel of the infant shortly after birth. Transfusion with mother's blood is the most effective form of treatment—only a small amount, 50 to 100 c.c., is required.

(4) **Addison's Anæmia.** With the exception of hæmorrhage and shock this is perhaps the most generally accepted indication for blood transfusion. It does not cure the disease, but in a considerable proportion of cases it brings about a definite improvement which may last for some time. Not only are the extra corpuscles added to the circulation, but the transfused blood has a stimulating effect on the patient's blood-forming tissues, with the result that there is a considerable increase in the number of red corpuscles, and this may persist for some months. Transfusion should be employed before the condition of the patient has become too serious, and as a rule should be tried as soon as it is clear that other methods of treatment are ceasing to be effective. A transfusion of not more than 500 c.c. should be given, and this should be repeated at intervals of a few weeks. Reactions of more or less severity are not infrequently met with after transfusion for pernicious anæmia. It is a wise precaution always to test the serum of the patient against the corpuscles of the proposed donor by the direct method. The serum reactions are not infrequently abnormal, and even the blood of a Group O or universal donor whose corpuscles should not be agglutinated by the serum of any patient may be incompatible in a case of pernicious anæmia. It should always be a rule that the blood should be given slowly and cautiously, and that at the first sign of any reaction the transfusion should be stopped. It is wise to give as an initial dose 100 to 200 c.c. of blood in the more severe cases.

The remarks about transfusion of blood in cases of Addisonian anaemia apply also to cases of severe anaemia in pregnancy due to other causes. Thus in the macrocytic anaemia of pregnancy, transfusion is of value as also in the more severe forms of secondary anaemia.

Selection of a Blood Donor. Certain precautions should be observed in choosing a suitable donor for transfusion. The following conditions should be satisfied :—

(1) The donor should be free from any infective or constitutional disease which might be transmitted to the patient. To eliminate this possibility the medical history of the donor must be carefully investigated, and he should also be examined for any physical signs of disease. The diseases that have been transmitted are malaria and syphilis. As regards the former a careful inquiry and microscopical examination of the blood will help to exclude its possibility. To exclude syphilis Wassermann and Kahn tests should be done and should be negative. The transmission of tuberculosis from an apparently healthy person with some quiescent lesion is extremely unlikely.

(2) The donor should be in a fit condition to stand the necessary loss of blood and should preferably possess large superficial veins.

(3) The blood of the donor must be compatible with that of the patient, that is, it must mix with it without causing agglutination or haemolysis.

Blood Groups. The importance of ensuring that there will be no harmful reaction between the blood of the donor and that of the patient need hardly be emphasised. When whole blood is injected intravenously into patients (blood transfusion), precautions must be taken to ensure that the offered red cells are compatible with the serum of the recipient. From the behaviour of their red cells under these circumstances it is found that people can be divided into four groups. When foreign red cells of an unsuitable nature (that is, of the wrong group) are injected, very serious symptoms and even death may ensue. The red cells are first agglutinated (that is, clumped together) into masses of varying size which may occlude capillaries in different parts of the body. They then undergo haemolysis and the liberated haemoglobin is partly excreted in the urine and partly broken down to form bilirubin, thus causing intense jaundice.

It is found that human beings fall into four groups when agglutination tests are performed; these are shown in the following

ing table. The sign + signifies agglutination, while — signifies no reaction:—

Corpuscles.	Serum.			
	1.	2.	3.	4.
AB	—	+	+	+
A	—	—	+	+
B	—	+	—	+
O	—	—	—	—

It will be noted that the corpuscles of Group O are not agglutinated by the serum of any of the other groups, and that the serum of Group AB does not agglutinate the corpuscles of any of the other three groups. Hence those belonging to Group O are sometimes known as "universal" and those belonging to Group AB as "universal recipients." Group A and Group B can only receive red cells from Group O and their own group.

Method of Grouping. If sera of Groups A and B are kept in stock, any red cells can be assigned to their respective group. Drops of the blood of the person to be tested are mixed with a drop of each of these sera, and, as shown in the table,

Group AB is agglutinated by Groups A and B.
 Group A " by Group B.
 Group B " by Group A.
 Group O " by neither Groups A nor B.

This method is not, however, infallible, as some cells behave irregularly as though they belonged to some unclassifiable group.

The only reliable method of determining compatibility is therefore to test directly the serum of the recipient against the donor's corpuscles. This should always be carried out in practice. A drop of the donor's blood is received in 1 c.c. of 1.5 per cent. sodium citrate solution to prevent coagulation. One drop of the resulting suspension of the donor's corpuscles is taken and mixed on a microscopical slide with one drop of the recipient's serum. The specimen is examined after a few minutes; if the red cells have become clumped (agglutinated), the bloods are incompatible.

Symptoms of Transfusion of Incompatible Blood. In the most severe cases the patient may die, and in some cases all the intermediate stages of transfusion reaction may be observed. The reaction is usually accompanied by a high temperature, a rapid pulse, and a high blood pressure.

introduction of 50 or 100 c.c. of blood; the patient first complains of tingling pains shooting over the body, fullness in the head, an oppressive feeling about the precordium, and later excruciating pain in the lumbar region. The face may gradually become cyanotic. Respirations are laboured. The pulse may become suddenly slow and the patient becomes unconscious for a few minutes. An urticarial rash develops in half the cases, either generalised or limited to the face. Later the pulse becomes rapid and thready, the skin cold and clammy and the condition grave. Rigor followed by a high temperature occurs within an hour and the patient may become delirious. Jaundice may appear later.

To avoid such a reaction the blood should always be transfused slowly and a careful watch kept during the passage of the first 100 c.c. for any adverse symptoms, especially if on account of urgency the blood of the donor has not been previously tested. Slight symptoms, such as some difficulty in breathing or precordial pain, may occur if the blood is being given too quickly, but any of the more severe symptoms are an indication that the transfusion should be stopped.

Methods of Blood Transfusion

(1) **Direct Transfusion.** In this method a communication is made between a small artery, usually the radial artery of the donor, and a vein, generally median basilic or cephalic, of the recipient.

This is done by an apparatus which consists of a special syringe, two rubber tubes and two special needles with connecting pieces. The barrel of the syringe is provided with lateral tubes to which two rubber tubes are attached, one bringing blood from the donor, the other transferring it to the recipient. The metal piston is provided with a groove. The piston having been pushed down, is rotated so that the groove is opposite the opening of the lateral tube connected with the vein of the donor. The blood from the vein of the donor is drawn up, the piston rotated through 180° so that the groove in the piston is now opposite the opening from which the second rubber tube passes to the needle in the vein of the recipient. The process can be repeated as often as necessary. Special needles for donor and recipient are used. The arrangement for sterilisation, lubrication and removal of air are carried out as usual. The donor and recipient must lie on couches on the same side.

(2) **Transfusion with Citrated Blood.** One hundred c.c. of 2 per cent. solution of sodium citrate in sterile water should be added to each 900 c.c. of blood, so that this volume contains

R. H. FACTOR

per cent. of sodium citrate. In actual practice it is usual to use the amount of citrate for 750 c.c. Before withdrawing the blood from the donor, he should be lying flat on a couch. A bandage is applied to the upper arm sufficiently tight to make the veins prominent. The skin over the surface is cleaned with soap and water and then with ether. No antiseptic is used. The blood is withdrawn by a sharp straight needle which is lubricated with liquid paraffin and is attached to a sterile lubricated rubber tube. This tube reaches to the bottom of a graduated flask which contains a sufficient amount of sodium citrate solution at a temperature of 105°. As the blood enters the flask it is thoroughly mixed with the citrate solution by stirring with a sterile glass rod.

The citrated blood thus obtained can be transferred to the recipient by the open method or by the use of syringe, or any of the special apparatus used for this purpose. The transfusion should be carried out slowly and the effect on the patient carefully watched. As a rule about twenty minutes should be taken to give 500 c.c., but if the patient's condition be not satisfactory double this time may be taken.

The Rh Factor in Intra-group Blood Transfusion Reactions
Experience with blood transfusion has shown that accidents sometimes occur in spite of the blood being given from a suitable intra-group donor. It is now known that there exist in the human red blood corpuscles of all four blood groups certain other factors or agglutinogens (antigens) for which no corresponding isoagglutinin have been found in human sera. Such types may be represented as M, N, MN, and P. These antigens (without corresponding anti-bodies) do not produce human transfusion reactions.

The Rh Factor: In 1940 Landsteiner and Wiener injected blood from a monkey (*Macacus rhesus*) into rabbits, thus developing agglutinins in the rabbits' serum which clumped the red cells of the monkey. They also noted that this same rabbit serum clumped not only the red cells of the monkey but also the red cells of 85 per cent of humans, regardless of their blood group. The red cells of the remaining 15 per cent of humans are not affected (i.e. do not get clumped) by the serum. This is obviously due to the fact that this group have in their red cells none of the agglutinogen (antigen) which is present in the red cells of the monkey or in the cells of 85 per cent of humans. This particular agglutinogen (antigen) is referred to as the *Rh* factor. Individuals whose cells contain this antigen (85 per cent) are termed *Rh* positive (*Rh* +). Those humans whose red cells do not contain the antigen (15 per cent) are termed *Rh* negative (*Rh* -). Experience has revealed the fact that when blood of an *Rh* + donor is transfused

into a Rh — recipient even of the same blood group, anti-Rh antibodies develop in the recipient's serum. In a subsequent transfusion of Rh + blood into the same recipient, these anti-bodies (agglutinins or anti-Rh substance) produced in the serum of the recipient by the Rh + cells of the earlier transfusion, cause agglutination and destruction of Rh + cells of the donor. Such an intra-group transfusion reaction may be severe enough to cause death.

It is now proved that Rh — persons develop anti-Rh immune bodies (agglutinins or anti-bodies) when transfused with Rh + blood even though both may be in the same blood group. In subsequent transfusions of Rh + blood these agglutinins produce the reaction. The prevention of this accident lies in the employment, in these cases, of blood from an Rh — donor of the proper blood group who has not previously been immunised.

The majority of intra-group transfusion accidents occurring particularly in pregnant or post-partum patients are due to Rh incompatibility. It will be seen from what has been stated above that no obstetrical patient should be transfused with blood of unknown Rh unless the patients' Rh is known. In the event of her being Rh negative, Rh negative blood is used for transfusion. When emergency transfusion is required and the patients' Rh has not been determined, only Rh negative blood should be used. When Rh negative blood is not available in either of these cases it is safe to use plasma instead of whole blood for transfusion.

The ideal thing to do is to type for Rh factor all prospective donors and recipients. This determination is especially important in patients who have received one or more previous transfusions, and in women who give a history of toxæmia, miscarriage, still-birth or Erthroblastotic children. All available relatives of known Rh — persons should be typed since it is known that among these individuals a greater percentage of Rh — persons will be found than among the relatives of those who are Rh +.

How to Test for Rh Factor: In a sterile test tube place 4 c.c. of saline to which one drop of blood is added. Centrifuge for 1 minute. Decant the supernatant fluid to remove fibrin and add 4 c.c. of additional fresh saline to suspend the washed cells. Place 2 drops of this suspension in another test tube and add 2 drops of known anti-Rh serum and shake lightly. Place test tube in a water bath at 37° c. Shake gently every 15 minutes. After 1 hour remove from water bath and centrifuge for 1 minute at not more than 500 revolutions per minute. Then agitate gently observing the precipitated cells. Examine for clumping macroscopically and microscopically. If there is no clumping

cells are considered Rh negative ; If clumping is present cells are Rh positive. Rh testing sera should be of a high anti-Rh titer.

What should be done when a Hæmolytic reaction occurs during transfusion ? The following steps should be taken forthwith : (1) Stop the transfusion immediately and if the patient's condition requires it, a plasma or serum transfusion should be substituted.

(2) Find out if a Hæmolytic reaction has occurred by drawing and centrifuging the blood and examining the plasma for Hæmolysis. Test the patient's and Donor's blood for Rh factor, if possible.

(3) Catheterise the patient 1 hour after the first appearance of the reaction, and examine the urine for Hæmoglobine, Red blood cells, and PH.

(4) Start alkalization immediately. This is accomplished by the administration of 4.0 grams of sodium bicarbonate by mouth every 4 hours and 4 per cent solution of sodium bicarbonate by rectal method every 4 hours. Alkalization should be continued to maintain the urinary PH above 7.0.

(5) Restore the cell volume and plasma proteins by giving Rh negative blood and plasma transfusion.

(6) With the occurrence of oliguria, restrict the fluid intake to between 2,000 and 3,000 c.c. daily to prevent overhydration.

(7) If convulsions occur in association with increasing hemoconcentration and acidosis extra sodium may be administered in the form of hypertonic saline.

The Rh factor and Erythroblastosis fetalis : The condition of Erythro blastosis is recognised clinically in the newborn by the presence of universal edema of the foetus (Hyrops), or as Icterus Gravis or as a marked anæmia. The condition is usually apparent at birth. In nearly every instance there is clinical evidence of blood destruction and liver involvement, accompanied by microscopic evidence of blood regeneration. The mortality rate varies from 50 to 100 per cent.

It has been shown recently that 90 per cent of these infants have in their blood cells the Rh. factor, inherited from the Rh ++ father. The mother takes this factor in her blood cells (Rh --). The blood destruction observed in the newborn is belived to be dependent on the presence in the baby's serum of a specific antibody which has been transferred from the mother to the baby in utero.

The earlier the condition of a possible Erythroblastosis is known the better becomes the prognosis. If in any expectant mother, the history reveals a reaction to any former blood transfusion or an unexplained spontaneous abortion, miscarriage or still birth (especially if the first baby was normal) one is suspicious

should be aroused as to the possibility of iso-immunisation. The history of the birth of an anæmic, jaundiced or oedematous infant, or a combination of any of these, is presumptive evidence of this condition. During labour a bile stained or amber coloured amniotic fluid, with or without signs of foetal distress, should place the obstetrician on guard and indicate to him the need for determination of Rh factor in mother and baby.

Management: Usually the first Rh + child of an Rh — mother and an Rh + father will survive possibly due to insufficient anti-body being present. Subsequent pregnancies may result in abortion or miscarriage, or the child near term may succumb to the disease in utero and be stillborn or survive labour only to die within a few hours from the effect of the disease. An Rh — baby is of course unaffected.

The oxygen tent and immediate transfusion of 60 c.c. of whole blood from an Rh — donor repeated at 48-hour intervals during the first 2 weeks of life, offer the best prognosis.

Infusion

By this is meant the introduction of an isotonic solution of salt in water or some other substance which will mix with the blood or tissues of the patient without causing any damage. Infusion of saline solution acts by increasing the quantity of fluid in circulation and thus increases the blood pressure, giving the heart a greater volume of blood to force along the arteries. The indications for infusion are much the same as for transfusion.

Preparation of the Solution. Ordinary boiled tap water may be safely used. The solution should always be isotonic with the blood plasma.

The following solutions may be used:—

(1) *Sodium Chloride Solution.* The strength is one and a half drachms of sodium chloride to a pint of water, or roughly one teaspoonful of salt to a pint of water. The solution is sterilised by boiling and should be at a temperature of 115° F. when introduced.

(2) *Locke's solution*, which is a physiological solution isotonic with blood plasma. Its composition is as follows:—

Sodium chloride	. . . . .	9 grms.
Calcium chloride	. . . . .	0.024 grm.
Potassium chloride	. . . . .	0.042 "
Sodium bicarbonate	. . . . .	0.01 "
Dextrose	. . . . .	0.1 "
Aqua	. . . . .	100 c.c.

ANÆSTHESIA IN LABOUR

(3) *Adrenalin Solution.* Adrenalin raises the blood pressure by causing constriction of the peripheral arteries when given either subcutaneously or intravenously. An infusion of saline solution should be given to which adrenalin hydrochloride has been added in the proportion of 1 in 50,000.

(4) *Dextrose Solution.* A 6 per cent. solution of dextrose is theoretically isotonic with human blood plasma. The following solution may also be used :—

Sodium chloride	. . . . .	70 grains
Potassium chloride	. . . . .	3½ "
Dextrose	. . . . .	9 "
Aqua distillata ad	. . . . .	4 drachms

The ingredients when dissolved are sterilised by boiling, and when added to a pint of boiled tap water form an isotonic solution.

(5) *Gum-acacia solution.* Bayliss advocated the addition of gum-acacia to saline solution. A 6 per cent. solution of gum-acacia in a 0.9 per cent. solution of sodium chloride is employed. The gum solution may be regarded as the most satisfactory solution for infusion, although it is definitely inferior to blood transfusion in bad cases. It is particularly useful in the treatment of hæmorrhage and shock.

There are three possible *methods of infusion* :—

- (1) Directly into a vein.
- (2) Subcutaneously.
- (3) Into the bowel.

The intravenous route is preferred in all serious cases.

APPENDIX II

ANÆSTHESIA AND ANALGESIA IN LABOUR

Of late the necessity for relieving the pains of child-birth has been realised by obstetricians, and the occasional publicity given in the daily press to different methods adopted for relieving the pains of labour has produced an insistent demand for such alleviation from the mothers.

So far as *anæsthesia* is concerned, it is required in the majority of obstetric operations both to relieve the woman of the pain of the operation and to help the obstetrician to perform the obstetric procedure with a greater amount of safety for the mother. The methods adopted in obstetric *anæsthesia* for the performance of operations will be dealt with later. But it is as well to point out that there are two considerations to be borne in mind :—

- (1) That the anæsthetic should be a safe one for the pregnant woman and should not have any deleterious effect upon the foetus.
- (2) That its use should not cause any complications postpartum, such as atony of the uterus and severe hæmorrhage.

The several anæsthetics that can be employed will be discussed with regard to their advantages and disadvantages.

The question of analgesia in labour is on a different footing. With the increased demands of society the need has arisen for the employment of a safe and certain method of analgesia which, while it will relieve the woman of the actual suffering, will not in any way affect the course of labour or the prognosis for the foetus. A safe analgesic is one that will satisfy the following conditions:—

- (1) It should completely relieve the patient of the suffering experienced during the course of labour.
- (2) It should not interfere with the progress of labour, i.e. with the force of uterine contractions or their frequency.
- (3) It should not increase the necessity for artificial assistance during delivery.
- (4) It should not in any manner jeopardise the condition of the foetus *in utero*.
- (5) The child should be born alive without any degree of asphyxia.
- (6) There should be no increased risk of postpartum hæmorrhage.
- (7) The process of involution during the puerperium should not be interfered with.
- (8) There should be no increase in the risks of sepsis from any cause, i.e., either because of the need for frequent vaginal examination or the need for interference.

Could these conditions be fulfilled, one would advocate the use of such an analgesic in every case, and our labour rooms would be far more pleasant and comfortable for the patients and the attendant midwives and obstetricians.

One other factor has also to be borne in mind. The ideal analgesic should be cheap, easily administered and should not necessitate the presence of a medical attendant throughout the course of labour. Obstetrics has still to be largely in the hands of midwives, as it is impossible for the majority of pregnant women to avail themselves of the help of an obstetrician. Such an analgesic has yet to be discovered, as it may be safely stated.

at present there is no drug on the market which can fulfil all the conditions. It is hoped that with the increasing interest now evinced in the subject of analgesia in labour, methods may yet be evolved which will go far to satisfy at least most of these requirements.

Anæsthesia in Labour

The chief methods of anæsthesia employed in obstetric surgery are (1) general, (2) spinal and (3) local.

The *general anæsthetics* used are :—

- (a) Chloroform.
- (b) Ether.
- (c) Nitrous oxide and oxygen.

For *spinal anæsthesia* various preparations have been used, the common among them being stovain, percaine, planocaine, ethocaine and novocaine.

For *local anæsthesia* infiltration with 0·5 per cent. of novocaine or percaine is usually employed.

General Anæsthetics. Chloroform still remains the most convenient anæsthetic for the majority of deliveries. It has been condemned in certain quarters, but either alone or as a mixture with ether (C_2E_3) it has been used very largely in our practice with no untoward results. It is desirable to emphasise in this connection that in most operative obstetric deliveries the ideal should be to produce what we term "obstetric anæsthesia." This consists in producing sufficient degree of anæsthesia to prevent the patient from struggling, as it is quite unnecessary in most obstetric operations to produce a deeper degree of anæsthesia generally known as "surgical anæsthesia." The application of forceps, extraction of a breech, episiotomy, suturing of a lacerated perineum, and many of the minor obstetric operations do not require more than "obstetric anæsthesia." Here the patient is lightly under and the administration should be discontinued in time so that the patient gets over the effects of the anæsthesia as the delivery is being completed. In one condition alone it is necessary that the woman should be under deep surgical anæsthesia, where the jaw is relaxed and the pupil moderately dilated. We insist upon this stage of anæsthesia wherever an intra-uterine manipulation is needed, particularly internal podalic version. In case of prolonged labour, where the uterus is tonically contracted, it is necessary to supplement the action of chloroform or ether by a preliminary injection of morphia. This is to avoid the possibility of rupturing the uterus in the course of such

internal manipulations by promoting the maximum amount of relaxation of the uterine musculature.

Chloroform is also used as an analgesic in some maternity institutions. For this purpose capsules containing about 20 to 30 minims of chloroform are employed. They can be broken in a handkerchief and inhaled by the patient.

There are certain conditions, however, where chloroform is definitely contraindicated. In severe toxæmias, by virtue of its deleterious action on the liver, chloroform is not a safe drug. It may also be unsuitable in conditions where diseases of the lungs or the heart are complicating pregnancy.

Ether may be given by the open method, alone or mixed with chloroform. There is a tendency for bronchial catarrh and, except in special cases, it is not generally advocated.

Gas and Oxygen. This is a safe anæsthetic, and wherever available, such as in maternity institutions, should be used as a routine. It is especially indicated in cases of pregnancy toxæmia, or where repeated general anæsthetics are required during a labour. Another method which has been recently introduced is the use of Cyclopropane but this requires special apparatus and a skilled specialist in attendance on every case which is beyond the reach of most patients.

Spinal Anæsthesia. This has been very largely used in recent years in obstetric practice. Spinal anæsthesia as a method of inducing anæsthesia in the area of the operation, as well as affording good relaxation, is well known in surgical and gynæcological practice. Its use, however, as a routine method in operative deliveries is not to be commended. In certain types of abdominal operative delivery it is an ideal anæsthetic. It is of great advantage because it produces efficient contractions and retractions of the uterus, diminishes the tendency for hæmorrhage, lessens the shock of the delivery, stimulates contraction of the intestines, while favouring complete relaxation of the abdominal muscles. For these reasons spinal anæsthesia has become very popular in the performance of Cæsarean section. Where the spinal anæsthesia has been successful no better anæsthetic could be desired. Unfortunately spinal anæsthesia has got one serious drawback: it occasionally produces a sudden and marked fall of blood pressure with serious collapse and even cessation of respiration, which sometimes ends fatally. Another complication noticed in some of the cases was that the patient developed generalised convulsions followed by a period of coma, and it was with considerable difficulty that she was ultimately revived. In view of these complications which we have witnessed not infrequently, we have defined

discarded the use of spinal anaesthesia in obstetrics, nor do we regret it because of the uniformly good results we have obtained with other methods of anaesthesia.

Local Anaesthesia. This method is used both for major obstetric surgery, such as Caesarean section and for minor operations—episiotomy, repair of perineal tears and low forceps. A 0.5 per cent. solution of novocaine or percaine is infiltrated into the area after proper antiseptic precautions have been taken. The method requires a certain amount of practice and has been extensively used by DeLee and other American obstetricians. We have practised the local infiltration method in cases of low forceps and repair of perineal tears and found it quite satisfactory. This method is especially useful where operative delivery by the vaginal route is required in cases complicated by toxæmias of pregnancy.

Analgesia in Labour

The object of analgesia in labour has already been explained, and the conditions that must be fulfilled if a successful analgesic is to be of general use. Many analgesics have been tried with varying degrees of success. Among the first of these analgesics to be tried was a combination of scopolamine and morphine, more popularly known as "twilight sleep." This consists in administering to the patient an injection of $\frac{1}{4}$ to $\frac{1}{2}$ grain of morphia with $\frac{1}{150}$ grain of scopolamine. The patient should preferably be in an isolated room, darkened, with pledgets of cotton-wool in the ears to prevent any noise or distraction. The first injection of morphine and scopolamine is given when uterine contractions are well established and the external os is beginning to dilate. A second dose of scopolamine, $\frac{1}{150}$ grain, is given half to one hour later, and depending upon the condition of the patient, scopolamine, $\frac{1}{150}$ grain, may be repeated three or four times at intervals of from one to two hours. The morphia should not be repeated. The effect of this method of analgesia is to put the patient into a half somnolent condition, so that when labour is completed she has no recollection of the pains. Occasionally a certain amount of mental excitement is to be noted. The method is only partially successful, and some patients become extremely excited and fail to respond and are quite alive to all that is going on and to the pains.

Apart from the occasional unsuccessful results, the chief drawbacks to the use of this method. There is undoubtedly a definite prolongation of the second stage of labour, necessitating more frequent examinations and an increased necessity for artificial assistance with the attendant risk of infection. Secondly, the

foetal mortality is definitely increased ; and while a large proportion of the children are born in a condition of apnoea, some of them are so deeply asphyxiated that they fail to respond to the usual methods of resuscitation. A word of caution is necessary if this analgesic is used. Not only must the patient be under continuous observation by the nurse in charge and supervised carefully from time to time by the doctor, but it is also necessary to realise that morphia should never be used after the membranes have ruptured or the second stage of labour has been reached. To obviate the harmful effects of this drug upon the fœtus, heroin hydrochloride and omnopon have been tried. On the whole, "twilight sleep" has limitations and cannot be advocated as a general method of analgesia.

Chloral and Bromide. Many patients in labour find some relief from the oral administration of chloral and bromide, the usual dosage being 15 grains of chloral hydras with 10 grains each of the triple bromides, potassium, sodium and ammonium. Syrupus chloral, 30 to 40 minims, may be given instead of chloral hydras. This draught is particularly useful where the patient is having teasing, ineffective pains, associated with a certain amount of rigidity of the cervix, or where early rupture of the membranes has taken place and the cervix is only one or two fingers dilated. The draught may be repeated once or twice at intervals of from four to six hours. In some of our cases we have given a certain amount of relief by the administration of chloral per rectum in doses of 60 to 90 grains. Chloretone has also been used with similar effect, in doses of half a drachm.

Barbituric Acid Preparations. Among the common drugs used for analgesia are the different preparations of barbituric acid. Barbiturates may be used alone or in combination with sedative drugs, such as morphia or its various preparations, or ether per rectum. Among the many preparations that are used are :—

Nembutal. This is about the most commonly used of barbituric acid preparations. It may be given either alone or in combination with scopolamine, paraldehyde or rectal ether. The object of these combinations is to promote a sedative effect. Nembutal can be given in the early stages of labour. The usual dose is between and $7\frac{1}{2}$ grains, given orally. An hour afterwards an injection of scopolamine, $\frac{1}{100}$ grain, or paraldehyde, 6 to 8 drachms in oil ($1\frac{1}{2}$ oz.) per rectum may be given. The nembutal may be repeated if necessary in smaller doses of 1 to $1\frac{1}{2}$ grains.

Nembutal does cause a certain amount of excitement and occasionally the patients are very boisterous. For this reason it is not generally safe in domiciliary practice. It increases also

incidence of operative interference. The patient has to be carefully watched and nursed in a separate room more or less darkened.

Amytal. Another barbituric acid preparation that has been used is sodium amytal. It can be given intravenously, 15 grains being used late in the first stage of labour. Sodium amytal is supposed not to interfere with the contractions of the uterus during labour, and the incidence of postpartum hæmorrhage in consequence is negligible. Moderate or complete amnesia is said to be present in most cases. The only drawback, particularly if the drug is administered in large doses, appears to be restlessness on the part of the patient. Hence constant nursing supervision is necessary. The drug is reported to have no harmful effects on the child and labour is said to be actually shortened rather than prolonged.

Sodium Evipan. This drug has been used as an anæsthetic in obstetrics and gynæcology. It is simple to administer, rapid in its effect and there is no excitation before the period of narcosis. For short obstetric procedures sodium evipan would appear to be ideal, and is therefore more useful when delivery is imminent rather than for analgesic purposes.

Among other preparations that have been used are pernocton, avertin, etc.

Gwathmey's Method of Analgesia. In this method several narcotic and analgesic drugs are combined, such as morphine, magnesium sulphate, ether and alcohol. Quinine is also used to counteract the effect of some drugs on uterine contractions.

The patient is given a large soap and water enema and immediately afterwards $\frac{1}{4}$ to $\frac{1}{2}$ grain of morphia with 2 c.c. of a sterile 50 per cent. solution of magnesium sulphate. The patient, as in all cases where analgesics are tried, is kept in a darkened room, her eyes covered and her ears plugged with cotton-wool. If the patient has been quietened by this injection one may wait; otherwise within half an hour the magnesium sulphate (2 c.c. of 50 per cent.) is repeated. As the patient comes round from the sedative effect of the injection the following is administered per rectum:—

Quinine alkaloid	20 grains
Alcohol	45 minims
Ether	2½ oz.
Olive oil, add up to	4 "

The patient is kept on her left side while the mixture is slowly introduced by means of a rectal catheter passed high up into the rectum. In cases of prolonged labour it may be necessary to repeat the rectal instillation, but the dose of quinine should be reduced. In some cases a third intramuscular injection of magnesium

sulphate may be given. The administration of quinine per rectum has not been devoid of dangers, particularly for the foetus, so that a modified method of treatment is to avoid the quinine. Where the uterus does not respond, or the contractions have been lessened on account of the effect of the other analgesic drugs, a small dose of pituitary extract is given hypodermically to counteract this adverse effect. The method, however, has not come into general use.

Recently many methods for relief from pain during child birth have come into vogue and most of them are by injection of substances into the tissues or into the spinal canal thereby paralysing the nerves which carry the pain impulses. Para-vertebral, Para-sacral and Caudal are three methods used for this purpose—of these the Caudal anaesthesia is coming into prominence now and the details of its use are as follows:—

Caudal analgesia in obstetrics is a recent innovation for relief of pain during labour. Clinical study has shown that blocking the sacral nerve roots abolishes the pain of distention of the birth canal, paralyses the skeletal muscles of the perineum and abolishes the tone in the smooth muscles of the Cervix; also extending the block to include the eleventh thoracic nerve root abolishes the pain of uterine contraction without impairing its force.

Hingson and Edwards as a result of their experience of continuous caudal analgesia claim that this method has the following advantages, viz., the relief of pain begins 5 to 15 minutes after the injection and can be kept on for any length of time; it does not interfere with the force of uterine contraction and that without abolishing the consciousness or voluntary efforts on the part of the patient; the duration of labour is materially reduced because of the relaxing effect on the cervix; it does not interfere with the cardiac or respiratory conditions of the mother and also there is no interference with the respiratory or other vital centres of the child; the possibilities of complications like post partum hæmorrhage are also minimized. After experimenting with various drugs, Hingson and Edwards have recommended the use of Metycaine because of its low toxicity, rapid action and uniformity of effect. A 1½% solution is used and about 200 c.c. may be required in a case, i.e. nearly 3 grams which represents about 7.5 mgm per kilo of body weight per hour.

The method is definitely contraindicated in marked disproportion cases, in placenta prævia and gross deformities of the pelvis especially in the sacral region.

The technique of this method is simple and should be initiated only after the labour is well established, cervical dilatation

begun and the patient feels a need for relief of pain. The patient is placed in Sim's position, the sacral hiatus is located $1\frac{1}{2}$ to 2" above the tip of the coccyx; as already stated the solution used is 1½% metycaine which is freshly prepared. Skin anæsthesia is obtained by raising a skin wheal with a few c.c. of this solution. A special malleable needle is then inserted into the sacral canal in the middle line through the hiatus. By attaching a Luerlok syringe to this needle carefully, aspiration is done and the result noted. It is important to recognise the position of the needle in the subarachnoid region since this may lead to a massive spinal injection with fatal results. The same result may follow an injection into the vein. Presence of blood or spinal fluid on aspiration shows that the needle is not in proper position. If there is any doubt, it is better to give 8 c.c. of the solution and watch for sometime to see if any loss of pain and motor power occur in the legs indicating that the solution is in the subarachnoid space. After making sure that the needle is in the sacral canal, 30 c.c. of the solution is injected and the patient watched for the action of the drug on her which will be shown by the patient experiencing a sense of fullness or discomfort in one or both legs; loss of pain sense to pin prick beginning at the tip of the coccyx and extending gradually forwards on to the perineum and upwards on the anterior abdominal wall; abdominal or uterine cramps are relieved; vasomotor paralysis occurs in the legs indicated by vasodilatation and flushing, cessation of sweating and increase in skin temperature on the soles of the feet. It takes about 20 minutes for the analgesia to reach the level of the umbilicus. Sometimes 30 c.c. may not be sufficient and then another 20 c.c. more may be necessary. Supplementary injection of 20 c.c. every 30 to 40 minutes will keep the average patient free of pain. The needle is left in position till the delivery is all over and the patient is free from pain.

APPENDIX III

POST-NATAL CARE

REFERENCE has been made in previous chapters to the care of the woman during the antenatal period and during the period of labour and the puerperium. It is not yet sufficiently realised that a woman recently confined has to be observed for some months after childbirth. Post-natal care is important from two points of view:—

- (1) There is no period at which a woman is more liable to develop intercurrent infections or fall a prey to

various diseases as the post-natal period, when her general vitality may be at a low level.

- (2) A woman after child-birth is never the same as she was before, and the extent of any damage which has been effected by parturition has to be carefully assessed with a view to adopting suitable remedial measures both for immediate and permanent relief.

The expression "the gynæcology of obstetrics" has come to stay, because a careful examination of many patients during the post-natal department of hospitals has revealed the fact that many minor gynæcological ailments are in reality the result of obstetric trauma which has been neglected. Some of the after-effects of pregnancy and parturition manifest themselves during the later weeks of the post-natal period, and if suitable treatment is not adopted at this stage they tend to develop and give rise to other complications. Such effects may be due to the toxæmias of pregnancy, the anæmias, late effects of septic complications and complications that are peculiar to the post-natal period.

In view of what has been stated above, it will be obvious that the organisation of a post-natal out-patient clinic is essential in every lying-in hospital, and it should be a matter of routine to subject every recently delivered woman to periodic post-natal examinations to ascertain and if necessary treat, any damage that has resulted from the delivery.

First Post-natal Examination. This examination should be conducted at the end of the lying-in period, generally ten to fourteen days after delivery, before the patient is actually discharged from the hospital. The points that have to be investigated are :—

- (1) Her general condition, in particular whether she is anæmic, the condition of her breasts, her gait, etc.
- (2) The state of the abdominal walls.
- (3) Condition of the perineum and, if sutures have been applied, whether the perineum is completely healed.
- (4) The presence or absence of any lochial discharge.
- (5) The condition of the vaginal walls.
- (6) The condition of the cervix, whether there are any lacerations or evidence of superadded inflammation.
- (7) The position and condition of the uterus; in particular whether it has involuted properly and whether there is any degree of displacement, backward or lateral.
- (8) The condition of the uterine appendages.

- (9) The condition of the parametrium, and in particular whether there is any tenderness or sign of inflammation of the pelvic cellular tissue.
- (10) The condition of the urethra and bladder.

At this stage in a normal case the uterus has again become a pelvic organ and is in the position of slight anteversion and antelexion; there should be no sign of inflammation of the tubes or the parametrium, and although the vagina is slightly relaxed, the perineum must be intact and there should be no cervical laceration or ulceration. The urine should be clear and contain no albumin or show any sign of infection of the urinary tract. The blood pressure also should be recorded. Under such conditions the patient should be advised about the after-care with regard to diet, regulation of the bowels, the amount of exercise to be taken and directed to come for a second examination at the post-natal clinic after an interval of six to eight weeks.

The Second Post-natal Examination. This is conducted at the end of the puerperium six to eight weeks after delivery, and at this examination it is possible to come to a more definite conclusion as to the extent of any damage that has resulted from pregnancy and parturition. A systematic examination of the patient is essential at this stage: her general health, the condition of her bladder, bowels and genitalia should be noted. A record should be maintained for future reference.

The examination includes the following:—

Blood Pressure. It is desirable to record the blood pressure, as in some cases of toxæmia of pregnancy or essential hypertension the blood pressure may continue to be high and may later give rise to other complications.

Hæmatological Examination. The importance of this examination, particularly in the tropics, need not be emphasised again. In many cases varying degrees of anæmia have been noted at the post-natal clinic, and if proper treatment is not adopted this may be followed by various superadded complications, such as diarrhoea, dysentery, chronic ill-health, neuritis, puerperal ascites, etc.

The condition of the *abdominal wall* should also be ascertained. It is remarkable how in some cases even after one delivery the abdominal wall becomes very much relaxed, with extensive discoloration due to pigmentation, leading later to symptoms almost akin to those of visceroprosis. The exact causation of this extraordinary weakness has not been ascertained, but it is possible that it is due to factors such as endocrine deficiency.

A careful examination of the *genitalia* should be made,

The *perineum* should be examined to note whether it is intact or whether, if sutured, it has healed properly. It is important to realise that sometimes, although the perineum is apparently intact, in reality it is not so. Only the skin may have united, leaving a big gap in the deeper structures, so creating a deficiency in the pelvic floor which at a later stage will predispose to prolapse. If the perineum has not united, or if there are healed lacerations, the condition of the anal sphincter should always be ascertained.

The *vaginal wall* should be carefully examined for the presence of ulceration or scars. It occasionally happens that near the fornices the vagina is lacerated and does not heal. Any tendency for cystocele or rectocele should be noted, as also the presence of any fistula.

The Cervix. It is most important that the cervix should be properly examined. It is therefore desirable to use a speculum. Lacerations of the cervix and infections give rise to many minor gynæcological complaints which result in chronic ill-health. Cervicitis may later give rise to an erosion with chronic leucorrhœa and be a precursor to malignant ulceration. The infection may also spread upwards to the uterine cavity, thus giving rise to endometritis, or in some cases it spreads into the general circulation, and causes complications such as myositis and rheumatoid arthritis, etc.

Uterus. The condition of the uterus, its size, its position, the presence or absence of any adhesions, the condition of the uterine adnexa and of the pelvic cellular tissue should also be carefully noted. Not infrequently the uterus is retroverted or retroflexed. Subinvolution may persist, so that the uterus is much bigger than it ought to be; tenderness if noted may be due to inflammation of the uterus or of the pelvic cellular tissue or of the adnexa. The tubes are sometimes easily palpable if they have been the seat of inflammation.

Exercises

If the patient is fairly normal and there is no evidence of any abnormality, she should be advised to carry out certain exercises during the puerperium and the post-natal period. They are calculated to promote the restoration and proper maintenance of the tonus of the abdominal muscles, to encourage the fall of the diaphragm and give exercise to the muscles of the lower extremities and the perineum, thus preventing any laxity of its musculature. An additional and most beneficial is massage. Apart from these exercises the patient should

advised to have regular outdoor exercises, which in these early stages may consist of short walks, morning and evening.

The diet should be fairly liberal and nutritious, care being taken to avoid all irritative or over-rich foodstuffs.

The patient should generally be advised to seek a further consultation after a period ranging from three to six months, a definite date usually being given so as to emphasise the need for this consultation. We believe that every case should be kept under observation for a period of one year at least, and that the patient should have opportunities of visiting the post-natal clinic at intervals of from two to three months. At this visit and during every subsequent visit the patient should be encouraged to bring the child with her, so that it can be attended to at an infant welfare clinic attached to the institutions. Here the mother is advised as to the proper method of feeding, the proper care of the breasts and such other advice as is necessary for the proper care of the baby.

We shall now refer in detail to some of the complications of the post-natal period and the methods of treatment to be adopted.

Complications met with at the First Post-natal Examination

Lacerated Perineum. The question of secondary repair of a lacerated perineum may arise at this period. In some cases the perineum does not heal satisfactorily and it may be possible to freshen the edges and put in secondary sutures. Wherever there is a reasonable possibility of healing and the wound edges are clean this may be done. If, however, the area is infected or is bruised it is advisable to instruct the woman to have the parts cleaned after micturition and defecation with antiseptic douches or washes. She should be further directed to attend the post-natal clinic at the third month after confinement.

The sequelæ of events following an unrepaired laceration of the perineum are rectocele, cystocele, prolapse of the uterus, incontinence of motions, general weakness of the pelvic floor, persistence of some degree of infection with resulting general constitutional debility. Hence the importance of ensuring an efficient perineum after delivery.

Lacerations of the Vagina. In most cases they tend to heal spontaneously with proper antiseptic care. Where such lacerations persist, the woman should be advised to attend the post-natal clinic, have daily vaginal douches and the parts touched, if necessary, with antiseptics, such as mercurochrome, acriflavine, alcoholic solution of picric acid or other mild antiseptics.

Lacerations of the Cervix. When these are met with it is better to treat them in the first instance with antiseptics so as to keep the edges clean. We consider that the proper time to repair these lacerations is after the third month after delivery. The patient should be warned that if the lacerations are allowed to persist they may lead to chronic cervicitis, erosion of the cervix and favour the development of malignant ulceration at a later stage. Apart from these considerations, where the cervix is badly lacerated the possibilities of subsequent abortion or premature labour should be borne in mind. Neglected lacerations are also likely to lead to an ascending infection, involving the uterus, Fallopian tubes, ovaries and the pelvic cellular tissue.

Displacements of the Uterus. By far the commonest of the complications that may be met with at this period is retroversion or retroflexion of the uterus. This often happens with a subinvolted uterus, or in cases where the uterus has been the seat of infection. It is necessary to rectify the displacement, and it is here that a suitable pessary will be found of great use. A Smith-Hodge's pessary can be introduced after the uterus has been brought to the correct position manually and kept *in situ* for six to eight weeks. The patient should be given the necessary advice about the necessity for a daily vaginal douche and warned of the dangers of leaving a pessary in the vagina indefinitely. Suitable measures ought also to be taken simultaneously to treat subinvolution if it is present.

Subinvolution of the Uterus. This is not infrequently met with, and in a large number of cases is due to some degree of infection. Apart from this it is seen in multiparæ and in women who have had other complications after delivery. To promote proper contraction and retraction of the uterus and to favour the expulsion of any discharges from the cavity, the patient should be given hot vaginal douches twice or thrice a day and echolics such as ergot, hydrastis, etc., besides tonics and hæmitinics to improve her general condition.

Inflammation of the Adnexa. Where there has been some degree of uterine or cervical sepsis the tubes and ovaries may become the seat of inflammation. It is necessary to realise that the treatment should be on conservative lines. Hot vaginal douches, ichthyol and glycerine tampons (10 per cent. solution) and poultices to the lower part of the abdomen may be used. In cases where the inflammation is tending to be chronic, protein shock therapy will be found beneficial. Injections of defatted sterilised milk may be given. The patient must have rest and suitable nourishment, the bowels regulated; and if specific organisms are isolated,

vaccine therapy must also be given. Physiotherapy is of first value in these cases.

The Care of the Breasts. It is necessary to examine the breasts and to note any abnormalities of the nipple or the lactating breast. The details with regard to this are dealt with in the chapter on the care of the new-born.

General Advice. We have referred to this earlier in the chapter, but it may be reiterated that the patient should be given definite instructions as to diet, care of the bowels and bladder, exercise, proper mental and physical rest and care in lactation. It is as well to give her a definite post-natal programme, so that she may chart her progress and make a note of any special points during the eight to twelve weeks before her next visit to the post-natal clinic.

Advice at the Second Post-natal Examination

At the second visit to the post-natal clinic a thorough general and pelvic examination should be made and any abnormalities noted. If the patient has taken all the precautions advised previously there should be few abnormalities noted at this examination. If any such abnormalities are noted they should be corrected.

Proper suturing of the perineum and repair of the cervix are essential. We have referred to the part these play in the causation of gynaecological complaints at a later stage.

We emphasise the need for a hæmatological examination, for the recording of the blood pressure, for a thorough examination of the urine and for noting the presence of any adnexal inflammation. It is also well to enquire into any disabilities in regard to walking, muscular activity, physical activity, etc. Not infrequently have we noticed a tendency for a mild form of decalcification associated with pain in the joints and bones and weakness in the muscles. Calcium therapy is indicated in such cases. Proper exercises for the muscles of the abdomen and of the perineum should be emphasised as already stated. If the general health of the patient is fair she may be given suitable advice and asked to report herself at intervals of three to four months at the post-natal clinic.

We shall now refer to some more general pathological conditions that may supervene during the post-natal period.

Puerperal Neuritis

Neuritis is a troublesome complication that may occur in the post-natal period. It may be two kinds—traumatic or peripheral.

Traumatic neuritis is not uncommon, especially where labour has been prolonged or delivery assisted. The application of forceps in an occipito-posterior position, or in moderate degrees of cephalopelvic disproportion, or the extraction of a breech may be followed by traumatic neuritis. The patient generally complains of pain coming on a few days after delivery; there may be tenderness along the course of nerves, particularly the sciatic; in some cases there may be numbness, a feeling of "pins and needles," and even inability to move the lower extremity. The pain may sometimes be excruciating. Prevention of such an injury is difficult. Where there is a history of previous severe neuritis, very careful examination should be made as to the possibilities of delivery through the natural passages without maternal damage, and as an alternative a Cæsarean section may have to be considered. In primiparæ with slight cephalopelvic disproportion, care should be taken in the application of forceps and in the force that is utilised in the extraction of the head.

Treatment consists in giving the affected part complete rest; the extremities should be immobilised by sandbags on either side, and if necessary a posterior splint may be used. The parts must be kept warm, pain relieved by sedatives, and at a later stage gentle massage and passive movements encouraged.

Peripheral neuritis is a complication that occurs occasionally during the puerperium. There is a flaccid paralysis of both lower extremities and the distal portions of the limbs are most affected. Hyperæsthesia of the skin and tenderness of the muscles may be marked. The condition lasts for several weeks and the patient is unable to move about. It is not infrequently associated with anæmia and occurs in patients who show other signs of vitamin deficiency. Deficiency of calcium has also been noted. In some cases there is a tendency for recurrence of this condition in subsequent pregnancies and puerperia.

Treatment consists in absolute rest in bed, nourishing diet, vitamin therapy, particularly in the shape of cod-liver oil and preparations rich in vitamin B. Later in the course of the disease gentle massage to keep up the tonicity of the muscles and mild passive movements are necessary.

Puerperal Ascites

This rare condition has occurred at all ages of the child-bearing period. Young women of twenty to twenty-five years after their first confinement have developed ascites in the puerperium, and a careful investigation of the ætiological factors concerned has failed to

CHRONIC ENTERITIS

any pathological condition associated with the heart, liver or kidneys. It would appear as if these cases are due to some nutritional deficiency. They are very resistant to treatment as the patient becomes progressively worse. The condition requires further investigation.

In cases of ascites occurring in the puerperium due to other causes such as heart lesions or ankylostomiasis, treatment of the causative factor generally results in an improvement and the ascitic condition clears up.

Chronic Enteritis

During the post-natal period inflammations of the gastrointestinal tract are by no means infrequent. In some cases this may be due to pathogenic organisms. The different forms of dysentery, amœbic and bacillary, especially in tropical climates, are frequent both during the puerperium and the post-natal period. Diarrhœa from other causes is also not infrequent. At this period, however, a special form of chronic enteritis develops, resulting in a severe type of anæmia, wasting, ulceration of the tongue, sprue-like diarrhœa and a dry inelastic skin. If the condition is neglected the patient gradually and progressively weakens and dies. Examination of the motions does not reveal the presence of any parasites. A hæmatological examination may reveal the presence of a severe type of secondary anæmia more often of the microcytic hypochromic variety.

The prognosis in these conditions is not unfavourable if the patient is treated sufficiently early. In neglected cases, however, the prognosis becomes grave, and if associated with other pathological conditions such as nephritis or myocarditis, the outlook is serious.

Treatment. The patient should be given complete rest, and at the early stages of the treatment the diet should be limited to fluids. Fruit juice, glucose, conjees and liver soup may be ordered. After a preliminary mild laxative the patient should be put on intestinal antiseptics and astringents. Simultaneously with this the patient should be given large doses of iron—ferri et ammonium citras, 60 to 90 grains per day—and cod-liver oil. In some cases preparations of vitamin B are very useful. Raw liver juice is also indicated if it can be tolerated. In more urgent cases one of the well-known liver extract preparations should be given intramuscularly.

Hemiplegia

This distressing complication has been noted not infrequently occurring in young women between the ages of twenty and thirty in the post-natal period. It has been recorded as occurring as early as the third day of the puerperium and as late as six weeks after delivery.

The exact causation of this condition is not clear. It is possible that in some of the cases a hypopietic condition in the puerperium or early post-natal period may favour the formation of a thrombus, thus giving rise to an embolus and the consequent hemiplegia. In none of the cases that we have studied has there been any suggestion of a septic endocarditis or evidence of any vegetations in the left side of the heart; nor has it been a feature necessarily of cases of puerperal sepsis. Hemiplegia may be of the right or left side. It may be a complete hemiplegia, more often on the left side, or occasionally it may be a monoplegia. Crossed hemiplegia has also been noted. The attack is sudden and is followed by a flaccid paralysis of the extremities on one side, which later undergoes the usual spastic changes in hemiplegia.

The prognosis depends upon the extent of the involvement and the size of the vessel affected and upon the immediate pathological changes which occur in the obstructed vessel. Fortunately it is sometimes of a transient nature and the effects disappear quickly; in others again it is more severe and chances of recovery are remote.

Treatment should be directed on the usual lines for cases of hemiplegia.

APPENDIX IV

ENDOCRINOLOGY IN OBSTETRICS

RECENT work has made it clear that various hormones have a large share in the physiological changes characteristic of pregnancy, labour and lactation. While there is yet much to be investigated before definite conclusions are reached with regard to the part played by the endocrines in pregnancy, experimental work and clinical observations have given us an idea of the rôle of the different endocrine glands in pregnancy. The chief endocrine glands are :—

- | | |
|----------------------------|-------------------|
| (1) The pituitary. | (5) The thymus. |
| (2) The thyroid. | (6) The placenta. |
| (3) The parathyroids. | (7) The ovaries. |
| (4) The suprarenal glands. | |

It is possible that further investigation may throw light upon some of the other accessory endocrine glands and the part they play alone or in combination with other endocrine glands.

The Pituitary Gland. This consists of an anterior lobe and a posterior lobe and an intermediary or connecting lobe. The anterior and posterior lobes of the gland are of different origin and possess different functions.

The Anterior Pituitary. The anterior lobe is responsible for several hormones, among which may be mentioned :—

- (1) Prolan A, which causes maturation of the follicles of the ovary.
- (2) Prolan B, which causes luteinisation of the follicles.
- (3) A growth-stimulating hormone.
- (4) A hormone that activates the breast.
- (5) A thyrotropic hormone which activates the thyroid tissue.

The two gonadotropic hormones, prolan A and prolan B, are concerned in bringing about ovarian response. Prolan A stimulates the secretion of oestrin, while Prolan B, as has been stated, causes luteinisation of the granulosa cells and formation the corpus luteum. During pregnancy the activity of the anterior pituitary increases and the hormones are excreted in the urine of the pregnant woman. The detection of these hormones in the urine of pregnant women through animal experiments constitutes the Aschheim-Zondek test.

The Posterior Pituitary. The posterior lobe of the pituitary produces three different hormones : (1) a hormone that stimulates the uterus, (2) a hormone that raises the blood pressure, and (3) an antidiuretic hormone. It would appear that both the anterior and posterior lobes act in a sense in opposite directions during the course of pregnancy, keeping up a balance in favour of the anterior pituitary during the continuance of pregnancy, while at the time of labour the posterior pituitary becomes more dominant.

The anterior lobe is itself under the influence of oestrian hormones which are secreted during the course of pregnancy. Thus the chorionic hormones are possibly responsible for influencing both the anterior and posterior lobes, acting as depressors throughout pregnancy and inhibiting the production of follicle-stimulating and prolactin hormones of the anterior lobe and the oxytocic principle (pitocin) of the posterior lobe. In this effort another hormone, progesterin, which is secreted by the corpus luteum and probably also by the placenta, helps to maintain relaxation of the uterine muscle. Progesterin gradually diminishes in

quantity after the sixth month, thus favouring progressive return of irritability of the uterine muscle, culminating in the strong labour pains that develop at term. The oestrin that is secreted throughout pregnancy is responsible for stimulating the growth of the breast. At or near term oestrin increases the irritability of the uterine muscle, which favour the action of oxytocin or pitocin secreted by the posterior lobe, and thus causes contraction of the uterus and the onset of labour. This is made possible by the gradual cessation of the production of progesterin, due to the degeneration of the corpus luteum. We thus see that the hormones of the pituitary gland act in close association with the hormones of the ovary and the placenta, and any deficiency in any of the hormones in this chain may possibly result in pathological changes during pregnancy.

The Thyroid. It is well known that during pregnancy the thyroid gland undergoes some hypertrophy, and increased activity is to be noted throughout gestation. Animal experiments have demonstrated that removal of the gland prolongs the period of pregnancy. It would appear that the general well-being of the pregnant woman, together with the increase in weight, is in some cases due to thyroid hypertrophy.

The Parathyroids. These glands have also been noted to enlarge and to become increasingly vascular. Dysfunction of the parathyroid brings about hypocalcæmia, a condition that is not infrequent in the pregnant woman. It may also give rise to undue irritability of the nervous system and of the muscular tissue, occasionally ending in abortion or premature labour.

The Suprarenal Glands. These glands undergo hyperplastic changes, notably in the cortical area. The hormone secreted by these glands has the following functions: (1) a general detoxicating action; (2) maintenance of hypercholesterolæmia of pregnancy; (3) possibly the pigmentary changes characteristic of pregnancy are due to this hormone; and (4) a mild glycosuria in pregnancy may be the result of this slight hyperadrenalæmia.

The Thymus. Under normal circumstances the thymus gland atrophies during adolescence and should be practically non-existent at the time of pregnancy. Sometimes a persistent thymus may be present. Such cases are of importance, as under chloroform anæsthesia sudden deaths have been reported in such cases.

The Placenta. It has already been stated that the placenta is probably responsible for a hormone which has got considerable influence over the other endocrine hormones. The placental hormones stimulate (1) uterine hypertrophy, (2) hypertrophy of

the thyroid and hypophysis, and (3) the growth of the mammary tissue.

The Ovaris. Recent experiments have completely demonstrated the fact that the ovary, with the corpus luteum, which forms in the early stages of pregnancy, is necessary only in the early part of pregnancy, that is, during the first trimester. The corpus luteum (1) inhibits further ovulation; (2) it helps in the formation of a healthy decidual membrane, whereby implantation and development of the fertilised ovum is rendered possible; (3) by inhibiting premature uterine contractions it allows gestation to proceed to term; and (4) it also influences the development of the breasts.

Endocrine Therapy in Obstetrics

Except for the posterior lobe pituitary extract, the result of endocrine therapy in obstetrics are on the whole disappointing.

Æstrin administration is rarely successful in induction of abortion, though it has been found more effective in (a) induction after missed labour. This method of terminating a case after missed labour is no doubt much safer than by operative interference. (b) *Æstrin* has also been successfully utilised in some cases of uterine inertia.

Corpus luteum extract has been used with satisfactory results in (a) some cases of habitual abortion, (b) in some cases of threatened abortion, and also in cases of (c) hyperemesis gravidarum of moderate severity.

Thyroid extract was employed until recently in cases of eclampsia and pre-eclamptic toxæmia with variable results. It has receded into the background since the more rational treatment described by Stroganoff has been popularised.

Posterior Lobe Pituitary Extract. This is without question the most potent endocrinological product in our obstetric armamentarium. Its main function is oxytocic, i.e., uterine stimulant.

(a) It is used extensively in hæmorrhages of pregnancy and labour. In the antepartum type of hæmorrhage usually small doses of pituitary extract, about $\frac{1}{2}$ to $\frac{1}{4}$ c.c., i.e., two to three units, are employed. For the postpartum variety larger doses, from $\frac{1}{2}$ to 1 c.c., frequently in combination with ergometrin, $\frac{1}{2}$ to 1 c.c., are given to produce efficient contraction and retraction of the uterus so as to stop the hæmorrhage.

(b) It has also been used in cases of inertia of the uterus in small doses, $\frac{1}{2}$ to $\frac{1}{4}$ c.c., particularly in the terminal second stage of labour. Pituitary extract thus administered can obviate the

necessity for forceps application. It is not to be thought of, however, when there is any disproportion or when evidences of foetal distress, such as a big caput, are already manifest.

(c) It can also be used with success for puerperal uteri which show a tendency towards subinvolution. It can with advantage be combined with hot vaginal douches and ergometrin.

(d) It is also a drug that is frequently employed in the medicinal method of induction of labour. It is here used in conjunction with castor-oil, an enema and quinine. It is to be administered in fractional doses of $\frac{1}{6}$ to $\frac{1}{4}$ c.c., by either the subcutaneous route, or, as is sometimes advised, by nasal application on a pledget of cotton-wool.

(e) Pituitary extract is also invaluable in relieving post-operative distension particularly after Cæsarean section. It is administered with the double object in view of augmenting intestinal peristalsis as well as speeding up uterine involution, which is usually sluggish after a Cæsarean section.

APPENDIX V

RADIOLOGY IN OBSTETRICS

One of the recent advances in obstetrics has been in the use of radiology in the diagnosis of pregnancy and its complications. Its value is being more and more appreciated by the obstetricians and it is useful beyond all doubt; but it is necessary to realise that the perfection in the technique of radiology as applicable to obstetrics is yet to be reached and hence, till then radiographic findings should only play a subsidiary but useful aid in clinical method of diagnosis.

The diagnosis of pregnancy by means of radiogram has been in vogue for several years; but as a shadow of the foetus is not generally positive before the sixteenth week of pregnancy, it is obvious its use is not of much value in the diagnosis of early pregnancy. Since the Aschheim-zondek test and Friedman's test have come into use and are so accurate even in early stages, the use of radiograph for purposes of diagnosis of pregnancy has receded into the background. It is of great value in the second half of pregnancy.

Pneumo-peritoneum. In this method of diagnosis, air or carbon dioxide up to 500 c.c. is introduced into the peritoneal cavity and a radiogram of the pelvis is taken. The air is introduced by puncture of the peritoneum with a needle introduced very

fully. An easier method is to pass the needle through the posterior fornix and introduce the air through it. If a skiagram is taken, the outline of the uterus can be made out to be globular and the changes in the lower uterine segment which consist in an enlargement of the isthmus of the uterus in its long axis with a lateral widening, can be observed. This appearance can be noted as early as the sixth or eighth week and the method may be tried in suitable cases.

Radiological methods afford information on many other points besides the diagnosis of pregnancy. An X-ray will show:—

- (1) The lie, position and attitude of the foetus
- (2) Whether multiple pregnancy is present. This is one of the certain methods of diagnosing twins, triplets etc., during pregnancy

- (3) Foetal abnormalities can be made out with certainty. Hydrocephalus, anencephalus, foetal monstrosities and malformations such as double monsters, spina bifida etc., can be made out

- (4) Hydramnios. In this condition which is very often associated with foetal malformations or twins, an X-ray picture affords a certain method of diagnosing the position, presentation and condition of the foetus as abdominal palpation and auscultation may not be serviceable in view of the distension of the uterus with fluid.

- (5) Period of gestation. In some cases radiograms may help to determine the period of gestation. The data on which the conclusion is arrived at are (i) the general appearance of the foetus (ii) the stage of ossification of the bones and (iii) the size of the foetal skull. The centres of ossification which may be useful are:—
The Cuboid 40th week : upper tibia 40th week : lower femur 35 to 40th week; astragalus 24th to 32nd week; os calcis 21st to 29th week. These accepted dates are only averages and hence much reliance cannot be placed on these findings.

- (6) Intra-uterine death of the foetus. This is an important condition which has to be recognized and occasionally clinical signs may not suffice to give a positive opinion as to whether the foetus is alive or dead. Overriding of the cranial bones is the chief diagnostic sign ascertained by the radiograph. This is known as Spalding's sign. Its presence before the onset of labour is a reliable indication of foetal death; a negative finding does not exclude foetal death. Always clinical findings must be correlated with the radiological findings before a final opinion is given. Other appearances of foetal death are (i) Pronounced spinal angulation with an accentuation of the lumbosacral curve, (ii) collapse of the thoracic cage which occurs only in advanced stages of maceration (iii)

appearance of the foetus as if rolled up into a ball (iv) disparity between the clinical estimate of the maturity of the foetus and the size of the foetal skull as determined by cephalometry and (v) continued lack of growth of the foetus as shown by repeated control studies at intervals.

(7) Vesicular Mole. In this condition, a radiographic examination is very useful. Absence of any foetal shadow in the presence of an enlarged uterus out of proportion to the period of amenorrhoea is very helpful. In the earlier weeks of pregnancy, this may not be of much value since, even otherwise, the foetal skeleton may not be visible always.

(8) Extra-uterine gestation in the later months may sometimes be diagnosed by means of X-ray. The fully developed foetus may be seen in the peritoneal cavity with the shadow of the uterus lower down or at any rate, not in its proper position. The unusual clarity of the foetal skeleton and considerable overlapping of the bony foetal parts by intestinal gas shadows may be of value. In some cases, it may be necessary to do a Hysterography using lipiodol before an accurate diagnosis can be made.

Besides these, advances in radiography have helped very much in the recognition of such grave abnormalities like Placenta Prævia, Cephalopelvic disproportion and abnormal configuration of the pelvis.

Four methods could be employed in the study of the placental attachment in utero and these are useful in the detection of Placenta Prævia; these methods are :

(i) *Amniography*. By this is meant the visualisation of the amniotic cavity by means of some opaque substance introduced into it. Amniography has been utilised more particularly in the diagnosis of placenta prævia. Direct radiography of the gravid uterus gives no reliable information as to the position of the placenta. With a view to recognise the position of the placenta by radiographic examination, two methods have recently been evolved in which contrast media are employed.

In the first method the limits of the amniotic cavity are demarked by the injection into it through the anterior abdominal wall of a radio-opaque substance—uroselectan B. The placental site in favourable cases is demonstrated as a filling defect on the uterine wall. Amniography is the most delicate test of the position of the placenta, which is available at the present moment. The recognition of the placenta depends upon (a) the unevenness of its surface and (b) its thickness. This unevenness is transferred to the line of the shadow of the amnion, and affords a simple method

of determining the position of the placenta. The more the placenta is curved the more accentuated does the irregularity become. Hence, in cases of placenta prævia, where the placenta lies in the lower pole of the uterus, the outline of the shadow abutting on it is greatly broken up and may be completely obliterated.

There is one serious objection, however, to the practical application of amniography. The injection of uroselectan B undoubtedly induces labour in about 60 per cent. of cases and cannot therefore be used with any degree of safety to the mother and the foetus until the pregnancy is so far advanced that the foetus can be reasonably expected to survive its immediate delivery. Excepting for this difficulty, amniography does not seem to have any adverse effect either on the mother or the foetus.

(ii) *Cystography.* The second method of determining the presence of placenta prævia is by the use of a radio-opaque solution of 12½ per cent. sodium iodide, injected per urethra into the bladder. When a skiagram is taken the outline of the bladder and the foetus can be easily made out and the diagnosis is based upon the relation between the contour of the head of the foetus in cephalic presentations and the shadow of the urinary bladder which is rendered opaque by means of the injection of the contrast medium. In all cases the contour of the foetal head in the lower uterine segment is continuous with the shadow of the bladder in the last three months of normal pregnancy; whereas a free space caused by the placenta separates the foetal head from the shadow of the bladder in cases of placenta prævia. This method is generally of diagnostic value if the pregnancy has gone beyond the twenty-eighth week. The space between the contour of the foetal head and the shadow of the bladder should be more than 1 cm. in width at least to have diagnostic significance. Separation of the cephalic and vesical shadows by a placenta prævia takes place regardless of the point of insertion of the latter on the anterior or posterior aspect of the lower uterine segment. The method has no value in the differential diagnosis of grave detachments of normally inserted placenta and in placenta prævia, if the foetus is not presenting by the cephalic pole.

(iii) *Soft tissue radiography.* By special methods of obtaining skiagram of the soft tissues, it has been found that a normally situated placenta is demonstrable as an opacity merging with the laterine wall and apparently increasing its thickness to a certain extent. The placental shadow usually occupies about one third of the uterine wall space as seen in lateral views. If the placenta is

not seen at the fundus or distinctly in the main body of the uterus, it must be in the lower uterine segment in a condition of previa.

(iv) *Thorium placentography*. Injection of thorium into the system will result in the substance being taken up by the placenta and this will make the placenta visible on an X-ray picture. The method is not used since the substance injected is likely to cause trouble because it is dangerous to the reticuloendothelial system in the body.

Recently, air cystography has been tried with success. 150 c.c. of air are injected into the bladder and studies in the relationship of the fundus of the bladder to the foetal skull in vertex presentation is made. The anteroposterior and lateral views are taken and the presence of the placental tissue, if any, made out by the nature of the shadow seen.

Value of radiography in the study of the pelvis and the foetal skull has been dealt with in the chapter on contracted pelvis. Pelvimetry and Cephalometry are useful in assessing the possibilities of delivery by the natural passages but in spite of the best efforts, surprises sometimes happen indicating that clinical methods of observation during labour is of paramount importance—probably of more value than the study of the shadows in the X-ray room. Its importance lies in focussing our attention to the possible trouble and thereby getting us armed beforehand as to enable the obstetrician to give the best suitable artificial assistance in difficult cases.

INDEX

- Abderhalden, 42
 Abdominal hysterotomy in induction
 of abortion, 757
 modes of delivery in contracted
 pelves, 576, 577
 primary, secondary and tertiary,
 337, 338
 wall, during puerperium, 124
 in pregnancy, 28
 Abortion, 310 *et seq.*
 acute specific fevers, in, 310
 causes of, 310, 313
 cervical, 315, 319, 324
 complete, 314
 complications in, 326
 criminal, 317
 differential diagnosis from certain
 conditions, 317, 318
 extra-uterine pregnancy, 318
 vesicular mole, 318
 displacements of uterus in, 312
 febrile, 316, 325
 foetal causes of, 312
 habitual, 327
 in retroverted gravid uterus, 507
 incomplete, 314, 319
 induction of, 754
 methods of, 756
 inevitable, 314, 319, 322
 inflammation of uterus in, 311
 investigation of causes of, 313
 malformations of uterus in, 312
 missed, 315, 319, 324
 nervous factors in, 311
 paternal causes of, 313
 prophylaxis of, 320
 symptoms of, 313
 syphilis in, 311
 therapeutic, 316
 threatened, 314, 319, 321
 toxæmias in, 311
 trauma in, 312
 tubal, 332
 Abruptio placentæ, 357
 Accouchement forcé, 766
 Acute infectious diseases during
 pregnancy, 211
 Addisonian type of anæmia, 244
 Addison's anæmia, blood transfusion
 in, 817
 Adnexa, inflammation of the, 837
 Albinism in pregnancy, 276
 Albuminuria in pre-eclamptic toxæ-
 mia, 160
 Allantois, 23
 Amenorrhœa, atypical in tubal
 pregnancy, 339
 in pregnancy, 33
 Amnio-embryonic vesicle, 21
 Amniography, 374
 Amnion, 22
 diseases of, 280
 Ampulla of tube, 15
 Ampullary pregnancy, 335
 Amytal in labour, 831
 Anæmia, pernicious, in pregnancy,
 244
 Anæmias in pregnancy, 243
 secondary, during pregnancy, 244
 Anæsthesia and analgesia in labour,
 825
 Anæsthetics in obstetric operations,
 666
 Analgesia (in labour), Gwathmey's
 method of, 831
 Anencephalus, 305
 Ankylostoma duodenale, 236
 Anselmino, 167
 Antenatal care, 69
 clinic, 71
 advice given at, 77
 Anterior fontanelle presentation, 396
 parietal presentation, 397
 Antero-posterior diameter of pelvis,
 3, 4
 Anus, imperforate, in new-born
 child, 654
 Appendicitis in pregnancy, 277
 Areolæ, 30
 Arterial supply of reproductive
 organs, 15, 16
 Aschheim-Zondek Test, 42
 Asphyxia neonatorum, 640
 livida, 641
 pallida, 641
 Asphyxiated baby, after-care of, 645
 Asynclitism, 93
 Auscultation in obstetric diagnosis,
 67
 Auto-hæmo-transfusion, 351
 Auto-infection, 771
 Baby. *See* New-born Child
 Bacilluria in pregnancy, 263
 Bacterial theory of cause of eclamp-
 sia, 167
 Bandl's ring, 482, 491, 629
 Barbituric acid preparations in
 labour, 830
 Barbour, 559
 Bartholin's cysts, 497
 glands, 10
 Basilectomy, 711
 Baudelocque's diameter, 2
 method of converting face into
 vertex presentation, 417

- Benedict's Test, 263
 Beri-beri in pregnancy, 233
 Beyrout's method of exteriorisation of the uterus, 274
 Biliary colic in pregnancy, 279
 Binder, use of, during puerperium, 126
 Birth "corpore conduplicato," 448
 Blackwater fever in pregnancy, 228
 Bladder, care of, during puerperium, 129
 in retroversion of uterus, 506, 507
 Bonney, 519
 Bougies, introduction of, in induction of labour, 764
 Brachial palsy, 652
 Brain in eclampsia, 168
 Braun, 712
 Braxton-Hicks' method of bipolar version in placenta prævia, 377, 379
 sign, 38
 Breasts, care of, 80-130
 changes in, during pregnancy, 30
 during the puerperium, 123
 inflammatory affections of, 812
 Breast-feeding, 134
 contraindications for, 135
 Breech deliveries, foetal injuries in, 444
 Breech presentations, 421
 complications in, 433
 differentiated from other varieties, 427
 frequency of, 422
 labour in, 422, 423
 positions in, 422
 Bregma, 60
 Broad ligament, anatomy of, 13
 Brow presentations, 400
 Budin, 551
 Buist, 390
 Byrd's method of artificial respiration, 645
 Cæsarean hysterectomy, in accidental hæmorrhage, 369
 section, 717
 conservative, 533
 contraindications for, 723
 difficulties and complications in, 728
 extraperitoneal, 577
 followed by myomectomy, 518
 for termination of pregnancy, 165, 183
 in abnormalities of vulva, 496
 in accidental hæmorrhage, 723
 in atresia of vagina, 497
 in cancer complications, 543-44
 in contracted pelvis, 576
 in eclampsia, 723
 in face presentations, 419
 in placenta prævia, 385
 in rigidity of cervix, 501
 in treatment of ovarian tumours, 539
 in transverse lie, 459
 indications for, 718
 indications in accidental hæmorrhage, 368
 lower segment, 730
 method of suturing in, 728
 post-mortem, 739
 prognosis of, 741
 repeat, 739
 rupture of uterus and, 640
 sterilisation at, 740
 Cæsarean section, technique in, 725
 time for operation, 724
 uterine forces in, 722
 vaginal, 742
 Calcium, deficiency of, during pregnancy, 32
 Caldwell and Moloy's classification of pelvis, 8, 581
 Cancer of cervix complicating pregnancy, 542
 Caput succedaneum, 648
 Cardiac lesions, induction of labour in cases with, 761
 Cardinal ligaments, 13
 Carrel-Dakin treatment of puerperal infection, 799
 Carunculae myrtiformes, 48
 Cephalhæmatoma, 648
 Cephalometry, 850
 Cephalotripsy, 711
 Cerebral malaria simulating eclamptic attack, 171
 Cervix, anatomy of, 12
 abnormalities of, 498-503
 cancer of, complicating pregnancy, 542
 changes in, during the puerperium, 123
 dilatation of, during labour, 85
 in induction of abortion, 756
 in induction of labour, 764
 full dilatation of, before applying forceps, 673
 hypertrophic elongation of, 522
 hypertrophy in pregnancy, 27
 lacerations of, 838
 during labour, 624
 malpositions of, 502
 oedema of, 501
 rigidity of, functional, 500
 organic, 498
 Chadwick's sign, 35
 Champetier de Ribes' bag, 380, 382, 434, 764
 Chicken-pox in pregnancy, 215
 Chloral and bromide in labour, 830
 Chloroform in labour, 827
 Cholera in pregnancy, 230
 Chopra Test, 228
 Chorea gravidarum, in pregnancy, 270
 induction of labour in, 735

- Chorion, 23
 diseases of, 280
 frondosum, 24
 villi of, 23
 Chorion-epithelioma, 287
 Aschheim-Zondek Test in, 44
 Chromosomes, 20
 conjugation of, 20
 Chyluria in pregnancy, 232
 Circulatory system during pregnancy, 30
 Cleidotomy, 714
 Clitoris, 10
 Coccyx, fracture and dislocation of, in labour, 618
 Coelom, 22
 Colostrum, 30, 123
 Comma vibrio, 230
 Confinement, estimation of date of, 52
 Conjugata vera, 2
 Conjugates, 2
 Contraception in heart disease, 204
 Contracted pelvis, 545
 abdominal modes of delivery in, 576
 Caesarean section in, 576
 classification of, 545
 course of pregnancy and labour in, 560 et seq.
 diagnosis of, 549
 during labour, 561
 exaggerated lithotomy position in, 574
 forceps in, 572
 frequency, 549
 induction of abortion in, 572
 induction of labour for, 569
 management of labour in, 564
 in different degrees of, 578
 pelvimetry in, 551
 postural methods, 574
 prognosis of labour in, 563
 radiographic examination in, 560
 special forms of, 583 et seq.
 spontaneous delivery in, 565
 test labour in, 566
 version in, 573
 Cornua, uterine, 15
 Corpus luteum, 19
 extract, 845
 of menstruation, 19
 of pregnancy, 19
 Cortex of ovary, 15
 Cranioclast, 710. See Craniotomy
 Cranioclast and cephalotribe, combined, 711
 Craniotomy, 705
 Credé's manoeuvre, 603, 607
 method of expression of the placenta, 118
 Cæva, 44
 "Crowning of the head," 88
 Curettage in puerperal infection, 800
- Curtis, 518
 Cyst, ovarian, twisting of, 347
 Cystocele and rectocele, complicating pregnancy, 522
 Cytoplasm, 20
 Cytotrophoblast, 21
- Das, Sir Kedarnath, 667
 Decapitation, 457, 712
 extraction after, 714
 technique in, 712
 Deficiency diseases in pregnancy, 271
 De Lee, 367, 386, 518
 Delivery, abdominal modes of, in contracted pelvis, 576
 Diabetes in pregnancy, 263
 induction of labour for, 762
 Diameters of pelvis, 2
 Diet in pregnancy, 77
 Dietary alterations causing eclampsia, 167
 Digits, supernumerary, 654
 Dilators, Matthews Duncan's, 323
 Hegar's, 323
 Diphtheria in pregnancy, 215
 Discus proligerus, 24
 Diverticulitis in pregnancy, 279
 Double monsters, 308
 Douglas' pouch, 334
 Ductus arteriosus, 26
 venosus, 26
 Dührssen, 454
 Dührssen's method for incision of cervix, 625
 Duncan, Matthews, 323
 Dysenteries in pregnancy, 267
 Dysentery, amebic, in pregnancy, 269
 bacillary, in pregnancy, 267
 Dystocia due to abnormalities of maternal soft parts, 495
 due to anomalies of the expulsive forces, 479
 due to faulty attitude, 395
 in labour, 387 et seq.
- Eclampsia, 165
 after-care in, 186
 albuminuria in, 173
 and Caesarean section, 723
 blood pressure in, 173
 cardiac failure in, 185
 complications in, 172
 foetal prognosis in, 175
 future pregnancy after, 189
 hyperpyrexia in, 185
 intrapartum, management of labour in, 183
 kidneys in, 168
 management of labour in, 181
 mental disturbances in, 185
 oedema in, 173
 prevention and treatment of complications in, 184
 prevention of fits in, 179

- pulmonary complications in, 184
- septic complications, 186
- termination of pregnancy in, 181
- treatment of, 175
 - Dublin method, 178
 - other methods, 188
 - radical, 187
 - Stroganoff's, 176
- types of cases, 174
- visual disturbances in, 186
- Eclampsism, 160
- Eclamptic convulsion or fit, 169
 - cerebral malaria simulating, 171
 - time of onset, 170
 - treatment during, 179
- Ectoderm, 22
- Ectopic pregnancy, 328 *et seq.* See Extra-Uterine Pregnancy
- Embryo, development of, 22
- Embryonic area, differentiation of the, 22
- Endocrine disturbance causing eclampsia, 167
- Endocrine glands in pregnancy, 32
- Endocrinology in obstetrics, 842
- Endometrium, 12
 - diseases of, cause of abruptio placentæ, 357
- Entamoeba histolytica*, 269
- Enteritis, chronic, 841
- Entoderm, 22
- Episiotomy, 110
- Epithelium, germinal, 15
- Ether in labour, 828
- Eutocia, 387
- Evisceration, 715
- Exercise during pregnancy, 79
- Exercises in post-natal care, 836
- Exomphalos, 451
 - in placenta prævia, 376
- External os, 12
- Extraperitoneal rupture in isthmal pregnancy, 334
- Extra-uterine gestation, 328
 - differential diagnosis in retroverted gravid uterus, 509
 - treatment of, 349
 - pregnancy. See also Ectopic Pregnancy repeated, 355
 - X-ray examination in, 45
- Extra-uterine and intra-uterine pregnancies combined, 356
- Face presentation, 405
- Facies hippocratica, 780
- Fallopian tubes, 14
 - in pregnancy, 28
 - infundibular portion of, 15
 - interstitial portion of, 15
 - isthmal portion of, 15
- Familial icterus gravis neonatorum, 143
- Feeding of new-born child. See New-Born Child
- Fehling's Test, 263
- Fertilisation of ovum, 20
- Fertility, time of highest and lowest, 21
- Fibroid tumours complicating pregnancy, etc., 525
- Fibromyomata complicating labour, 527
 - the puerperium, 527
- Filariasis in pregnancy, 232
- Fimbriæ, 15
- Flexion, 92
- Fœtal abnormalities, X-rays showing, 847
 - ascites, 307
 - causes of abortion, 312
 - circulation, 24
 - elements, absorption of, causing eclampsia, 167
 - head and its diameters, 60
 - moulding of the, 92
 - sutures of, 59
 - heart, 67
 - injuries in breech deliveries, 444
 - movements, 38, 39
 - ovoid, length of, 52
 - parts palpation of, 38
 - syphilis, 303
 - Wassermann Test in, 303
- Fœtus, anencephalus of, 305
 - ascites of, 307
 - attitude of, 55
 - circulation of, 24
 - death of, during parturition, 647
 - during pregnancy, 303, 646
 - toxic absorption in, 54
 - destructive operation on, 704
- Fœtus, developmental anomalies of, 305
 - diagnosis of intra-uterine death of, 847
 - diseases of, 303
 - effect of labour on, in contracted pelvis, 562
 - excessive size of, induction of labour for, 762
 - expulsion of, 87
 - fixation of the head of, 53
 - habitual death of, *in utero*, induction of labour for, 762
 - hydrocephalus of, 306
 - lie of, 55
 - mummification of, 338
 - papyraceous, 461
 - physiology of, 24
 - position of, 56
 - presentation of, 55
- Follicles, Graafian, 15
 - primordial, 19
- Fouadin in granuloma inguinale, 234
- Fontanelles of fœtal head, 60
- Forceps, 667
 - application, introduction of blades, 676

- prognosis in, 688
 traction in, 678
 causes necessitating application of, 671
 Das Calcutta, 668
 high and low, 681
 in brow presentations, 687
 in face presentations, 687
 indications for use, 669
 Kielland's 690
 locking of, 677
 Milne Murray's 667
 occipito-posterior positions of vertex with, 686
 Pajot's manœuvre, 685
 Simpson-Barnes' 685
 slipping of, 683
 Tarnier's, 667
 to the after-coming head, 687
 to the decapitated head, 688
 Fornix, vaginal, 11
 Fossa navicularis, 10
 Fossæ, para-rectal, 14
 Fourchette, 10
 Fowler's position, 221
 Friedman's Test, 43
 in hydatidiform mole, 284
 Fundal grip, 63

 Gas and oxygen in labour, 828
 Gastro-intestinal tract, diseases of, in pregnancy, 267
 Generative organs, physiology of, 18
 Genital organs, external, 9
 internal, 10
 Genitalia, external, changes in, during puerperium, 123
 Gestation, period of, X-ray estimation of, 847
 Gestation sac, rupture of, 343
 Glabellar presentation, 420
 Glands, lymphatic, of reproductive organs, 17
 Glucose in eclampsia, 188
 Gonorrhœa in pregnancy, 220
 Graafian follicles, 15
 fertilisation in, 329
 Granuloma inguinale in pregnancy, 223
 Greenhay, 742
 Gwathmey's method of analgesia, 831

 Hæmatological examination, methods of, 241
 Hæmatometra, 45
 Hæmophilia, blood transfusion in, 817
 Hæmorrhage, accidental, Cæsarean section in, 423
 and shock, blood transfusion in, 816
 complications in, 370
 in abortion, 328
 in new-born, 147
 in pregnancy and labour, 357
 indications for Cæsarean section, 368
 induction of labour in, 761
 mistaken for acute hydramnios, 292
 postpartum, 598
 secondary, complicating rupture of uterus, 639
 severe or fulminant type of, 368
 Hall, Marshall, method of artificial respiration of, 644
 Harelip, 654
 Head of new-born child, injuries to, 648
 Heart disease and marriage, 203
 and pregnancy, 194
 hypertrophy of, during pregnancy, 30
 muscle in eclampsia, 168
 Hebstectomy, 575
 Hegar's dilators, 323, 740
 sign, 36, 40, 41, 339
 Helminthiasis in pregnancy, 235
 Hemiplegia, 842
 Hernia, amniotic, 654
 into the umbilical cord, 654
 Higginson's syringe, 382
 Hilum of ovary, 15
 Hoffman, 167
 Hookworm disease. *See* Helminthiasis
 Hour-glass spasm of uterus, 491. *See also* Uterus
 Hydatidiform mole, 51, 280
 Aschheim-Zondek Test in diagnosis of, 42
 Hydramnios, 51
 acute, in differential diagnosis of abruptio placenta, 362
 associated with anencephalus, 305
 complications in, 292
 hæmorrhage mistaken for, 291
 hydatidiform mole mistaken for, 284
 in pregnancy, 289
 in prolapse of the cord, 460
 induction of labour in, 762
 Hydrocele and inguinal hernia, 657
 Hydrocephalus, 306
 Hydrothorax, 307
 Hymen, 10
 Hyperemesis gravidarum, 31, 34, 70, 150
 treatment of, 153
 Hypothyroidism in pregnancy, 265
 Hysterectomy, Cæsarean, 533, 577, 736
 Hysterotomy, abdominal, 757
 vaginal 767

 Icterus gravis, 143
 Icterus neonatorum, 142
 Incarceration in ovarian cysts, 537
 Induction of labour in contracted pelvis, 569. *See* Labour; Induction of

- Infant, changes in circulation after
 birth, 26
 premature, care of, 140
 Infantile beri-beri in pregnancy, 211
 convulsions, 143
 Infarct formation of placenta, 208
 Influenza during pregnancy, 211
 Infundibular pregnancy, 336
 Infundibulum of tube, 15
 Infusion, 824
 Insanity, reproductive, 813
 Insufflation, 645
 Insulin in treatment of hyperemesis,
 156
 Intercristal diameter of pelvis, 2
 Internal os, 12
 Interspinous diameter of pelvis, 2
 Interstitial portion of tube, 15
 Inter-trochanteric diameter of pelvis,
 2
 Intestinal obstruction in pregnancy,
 279
 toxins, absorption of, causing ec-
 clampsia, 167
 Intraperitoneal rupture in ampullary
 pregnancy, 336
 in isthmal pregnancy, 333
 Intra-uterine douche in puerperal
 infection, 799
 swab, technique of taking, 786
 Isthmus of tube, 15
 Isthmus uteri, 12

 Jacquemier's sign, 35
 Jardine, 712
 Jaundice, catarrhal, in new-born, 143
 in pregnancy, 159
 Jellett 518
 Jellett's classification of contracted
 pelves, 547

 Kahn Test, 219
 Kala-azar in pregnancy, 228
 Kidney in eclampsia, 168
 in pregnancy, 162
 Krause's method of induction of
 labour, 764
 of terminating pregnancy, 165, 182

 Labia majora, 9
 minora, 10
 Labour, accessory muscles of, 87
 anaesthesia and analgesia in, 825
 bed, 100
 causes of, 82
 complicated by double monsters,
 308
 by ovarian tumours, 535
 control of hæmorrhage in, 90
 definition of, 82
 delivery of the body in, 112
 of the shoulders in, 97, 111
 treatment with increased flexion in
 vertex presentation, 93

 Labour, dilatation of the cervix in,
 85
 of the vagina and vulva in, 87
 dystocia in, 387
 fibromyomata complicating, 527
 first stage of, 83
 management of, 105
 flexion in, 92
 forces concerned in, 91
 hæmorrhages in first two stages of,
 357 et seq.
 in breech presentation, 422
 in uterine malformations, 504
 induction of, 759
 indications for, 759
 medicinal methods of, 765
 methods for, 763
 internal rotation in vertex presenta-
 tion, 94
 lacerations during, 617
 management of, 101
 cardiac patients during, 202
 with eclampsia, 181
 mechanism of, 91
 missed, 493
 moulding of the head in, 92
 muco-sanguinous discharge during,
 84
 normal, 98
 nourishment in, 106
 obstetric examination in, 102
 perineal lacerations in, 107, 114
 precipitate, 480
 premature, 310
 preparation of the patient for, 101
 preparations for, surroundings, 99
 rupture of the membranes in, 87
 artificial, 106
 second stage of, 87
 management of, 106
 signs and symptoms of, 105
 stages of, 83
 test, for fibroids complicating preg-
 nancy, 533
 the "show" in, 85
 third stage of, 88, 98
 common mistakes in, 115
 complications of, 536
 management of, 115
 tumours complicating, 524
 uterine contractions during, 84, 87
 vaginal examination in, 102
 vertex presentation, extension and
 birth of foetal head, 95
 external rotation, 96
 restitution, 96
 with transverse lie, 445
 Lacerations of cervix during labour,
 624
 of perineum during labour, 620
 of vagina during labour, 624
 post-natal, 836
 Lachapelle, Madame, memoirs
 418
 Leontion, 123

- Laminaria tents for dilatation of the cervical canal, 757
 Langhans' layer of cells, 21, 281
 Latzko's operation, 576
Leishmania Donovanii, 228
 Leprosy in pregnancy, 234
 Ligament, ovarian, 15
 Ligamenta transversalia colli, 13
 Ligaments of uterus, 13
 round, in pregnancy, 28
 Linea albicantes, 30, 38
 Linge, 167
 Liquor amnii, 22
 folliculi, 19
 Lithopædion, 338
 Litzmann's classification of contracted pelves, 546
 obliquity, 93, 398
 Liver, acute yellow atrophy of, in pregnancy, 158
 changes of, during pregnancy, 31
 in eclampsia, 168
 in hyperemesis gravidarum, 151
 Lochia, 130, 778
 Lochiometra, 129
 treatment of, 800
 Lungs in eclampsia, 168
 tuberculosis of, induction of labour in, 761
 Lymphatic supply of reproductive organs, 17

 Mackenrodt's ligaments, 13
 Madras, Government Hospital for Women and Children, 172, 280, 359, 371, 422, 445, 459
 Magnesium sulphate in eclampsia, 188
 Malaria in pregnancy, 224
 Martin, 551
 Martin's method in breech presentation, 441
 Maturation of ovum, 20
 Mauriceau-Veit method in breech presentation, 442
 Measles in pregnancy, 215
 Medulla of ovary, 15
 Medullary plate, 22
 Melsana neonatorum, 147
 blood transfusion in, 817
 Membranes, examination of, 117
 foetal, 22
 puncture of, in termination of labour, 164
 retained or adherent, 610
 retention of, 117
 rupture of, before application of forceps, 673
 for induction of labour, 763
 in breech presentations, 433
 in face presentations, 415
 in occipito-posterior position, 391
 in transverse lie, 454

 Menopause, premature, as result of removal of ovaries, 20
 Menstruation, 18
 age at onset, 18
 amount of blood lost in, 18
 disturbances associated with, 18
 duration of, 18
 periodicity of, 18
 relation to ovulation, 19
 Menstruation, suspension of, in lactation, 18
 suspension of, in pregnancy, 18
 Mental instability, induction of labour in, 763
 Mesoderm, 21
 Mesovarium, 15
 Metabolism, diseases of, in pregnancy, 263
 Metreurynter in placenta prævia, 380
 in treatment of abruptio placenta, 367
 Metritis, chronic, 45
 Michaelis's rhomboid, 552
 Milk, comparison of, cow's and human, 136
 cow's, 136
 human, composition of, etc., 124
 Miscarriage, 310
 Mole, blood, 315
 carneous, 315
 hydatidiform. *See* Hydatidiform Mole
 tuberosa, 315
 vesicular, 318
 Moller, Essen, 385
 Momburg's belt, 603
 Mons veneris, 9
 Monsters, double, 308
 ischiopagus, 309
 syncephalic, 309
 thoracopagic, 309
 Montgomery's follicles, 30
 Morning sickness in pregnancy, 31, 33, 34, 70
 Morphine in treatment of eclampsia, 176, 180
 Morula, 21
 Mulberry stage, 21
 Multiple pregnancy, 469
 complications in, 476
 diagnosis of, 473
 labour in, 473
 presentations in, 472
 treatment in, 474
 Munro-Kerr-Müller method in induction of labour in contracted pelvis, 571
 Murray, Milne, 667
 Muscles, coccygeus, 1
 Levatores ani, 1, 10
 Obturator internus, 1
 Pyriformis, 1
 Musculospiral nerve paralysis, 653
 Myomectomy, 532

- Nadelhoffer, 742
 Nagels obliquity, 96, 395, 397
 pelvis, 589
Necator americanus, 236
 Nembutal in labour, 830
 Neoplasms, vaginal, 498
 Nephritis, chronic, induction of labour
 in 760
 in pregnancy, 253
 occult, 162, 174, 182
 in pregnancy, 253
 Nerves of genital organs, 17
 of new-born child, injuries to, 651
 Nervous system, diseases of, in preg-
 nancy, 270
 in pregnancy, 32
 Neurenteric canal, 22
 New-born child, accidents and in-
 juries to, 646
 asphyxia of, 640
 bath of, 134
 bowels of, 133
 care of the, 133
 care of eyes of, 133
 of umbilical cord, 134
 circulation of, 26
 clothing of, 134
 diseases of, 141
 feeding of, artificial, 136
 breast, 134
 care of the bottle in, 138
 proprietary foodstuffs in, 139
 fracture of bones in, 653
 hæmorrhages in, 147
 imperforate anus, 654
 injuries to nerves of, 651
 micturition of, 133
 surgical affections of, 654
 weight of, 134
 wet nursing of, 136
 Nicholson, 167
 Nuchal position, 433
 Nucleus, 20

 Oblique diameters of pelvis, 4
 presentations, 445
 Obstetric diagnosis, methods of, 63
 et seq.
 outfit, 100
 Obstetrics, endocrine therapy in,
 845
 endocrinology in, 842
 Occipito-posterior positions, 387
 Oedema in pre-eclamptic toxæmia,
 160
 Estrin, 845
 Oligohydramnios, 51
 in pregnancy, 294
 Oöphoritis, 775, 779, 806
 Operations, obstetric, 659
 Ophthalmia neonatorum, 141
 Oslander's sign, 35
 Osteomalacia in pregnancy, 271
 Ostium of Fallopian tube, 15
 Ovarian cyst, rupture of, 538
 twisted in pregnancy, 278
 Ovarian tumours, 46
 complicating labour, 535
 complicating pregnancy, 535
 cystic, 535
 solid, 541
 Ovaries, 15
 arterial blood supply of, 15
 at birth, 18
 germinal epithelium of, 19
 internal secretions of, 19
 ligament of, 15
 removal of, before puberty, 20
 Ovary, tumours of, in differential
 diagnosis of retroverted gravid
 uterus, 510
 Ovulation, 18
 occurrence of, 19
 relation to menstruation, 19
 Ovum, 18
 death of, 51
 discharge of, from ovary, 19
 diseases and abnormalities of the,
 280 et seq.
 Ovum, diseases of, cause of abruptio
 placenta, 357
 fertilisation of, 21
 implantation of, 331
 maturation of, 20

 Pajot's manoeuvre, 685
 Palate, cleft, 654
 Palpation, abdominal, 63
 perineal, 104
 Pampiniform plexus, 16
 Parametritis, 776, 778
 Parathyroids, 842
 Parturient canal, injuries to, 617
 et seq.
 Pawlik's grip, 64, 407
 Pelvic cavity, enlargement of, 746
 cellulitis, 778, 806
 diaphragm, 2
 grip, second, 64
 joints, relaxation of, in pregnancy,
 6, 32
 peritonitis, 779
 presentations, 421
 Pelvimetry, 105
 external, 551
 in pregnancy, 75
 internal, 556
 radiological, 45
 Pelvis, anatomy and physiology of, 1
 assimilation, 594
 bony, enlargement of, 575
 cavity, 1, 5
 contracted, 545 et seq. See Con-
 tracted Pelvis
 diameters of, 2
 difference between male and
 female, 8
 dwarf, 584
 false, 1
 flat, 585

- fractures of, 597
- funnel-shaped, 591
- generally contracted, 583, 585
- inlet of, 2
- joints of, 6
- measurements of, 2. *See also*
Pelvimetry
- external and internal in pregnancy,
75
- Nagele's, 589
- obliquely distorted, 588
- obstructa, 594
- outlet of, 1, 4
- peritoneum of, 13
- planes of, 2
- pseudo-malacosteon, 595
- rickety triradiate, 595
- Robert's, 591
- sciotic, 590
- split, 597
- spondylolisthetic, 593
- transversely contracted, 591
- triradiate, 273
- true, 1
- tumours of, 597
- types of, 581
- Perforation. *See* Craniotomy
- Perimetritis, 776
- Perineum, 10
- Perineum, injuries to, in labour, 620
- lacerations of, 107, 114, 117, 798
- protection of, 108
- repair of, 118
- rigid, 495
- Peritoneal relations, 13
- Peritoneum during puerperium, 124
- Peritonitis complicating rupture of
uterus, 639
- Phimosi, 654
- Phlegmasia alba dolens, 777, 811
- "Physiological chill," 90
- Pica, 34
- Pituitary extract, 845
- injections of, in placenta prævia,
377
- gland, 842
- Placenta, 22, 24
- accreta or increta, 299
- adherent, 609
- or retained, sequelæ of 611
- anomalies and diseases of, in preg-
nancy, 295
- "battledore," 297
- bipartite (illus), 298
- diseases of, in pregnancy, 298
- examination of, 117
- expression of, 116
- by Credé's method, 116
- expulsion of, 89
- fenestrata, 295
- horse-shoe, 298
- in eclampsia, 168
- infarcts of, 298
- lobate, 295
- marginata or circumvallata, 297
- membranacea, 295
- Placenta prævia, 298, 370
- Braxton-Hicks' method of bipolar
version in, 379
- Cæsarean section in, 385, 723
- vaginal, 385
- complications in, 386
- differential diagnosis from abruptio
placentæ, 362
- immediate delivery in, 384
- induction of labour in, 761
- metreurynter in, 380
- rupture of membranes and injec-
tions of pituitary extract, 377
- simple rupture of membranes in
treatment of, 377
- treatment of, 376
- vaginal tamponage in treatment of,
378
- Willett's forceps in, 382
- Placenta, retained, 605
- retention of, 117
- separation of, 88, 115
- succenturiata, 296
- syphilis of, 298
- tuberculosis of, 298
- velamentous insertion of, 301
- Placentæ abruptio, 357
- Placental polypus, 611
- Placentitis, 298
- Plasmodi-trophoblast, 21
- Playfair-Partridge, method of con-
verting face into vertex presentation,
416
- Plicæ, 15
- Pneumothorax, artificial, in tuber-
culosis complicating pregnancy,
208
- Polar body, first and second, 20
- Polypus, fibroid, differentiated from
chronic puerperal inversion,
615
- placental, 611
- Porro's operation, 576
- Porte's method of exteriorisation of
uterus, 274
- operation, 577
- Position, Walcher's, 8
- Posterior lobe pituitary extract, 845
- Postnatal care, 132, 833
- complications in, 837
- Postpartum hæmorrhage, primary,
598
- secondary, 604
- Potter, 699
- Pouch of Douglas, 14
- utero-vesical, 14
- Prague method in breech presenta-
tion, 440
- Pre-eclamptic toxæmia, indications
for termination of pregnancy,
165
- blood pressure in, 160

- induction of labour in, 760
- Pregnancy, abdominal, 345
 - abdominal wall in, 28, 48
 - palpation and auscultation in, 74
 - primary, 329
 - secondary, 337
 - tertiary, 338
- Pregnancy, acute infectious diseases
 - complicating, 211
 - salpingitis in, 278
 - yellow atrophy of the liver in, 157
- advice during, 7
- amenorrhoea in, 33
- ampullary, 335
- anæmias in, 240
- and future pregnancies, 203
- and heart disease, 192
- appendicitis in, 277
- Aschheim-Zondek Test in, 42
- auscultatory signs in, 67
- bacilluria in, 263
- ballotement in, 39
- bath in, 80
- beri-beri in, 233
- biliary colic in, 279
- blackwater fever in, 229
- bladder in, 32
- blood pressure in, 30, 77
- bowels in, 80
- breasts in, 30, 34, 80
- cancer complicating, 542
- cardiac complications. *See* Pregnancy, diseases of the heart and cervix in, 36
- changes in disposition during, 34
- chicken-pox in, 215
- cholera in, 230
- chorea gravidarum in, 270
- chyluria in, 232
- circulatory system in, 30
- clothing in, 79
- cornual, 340
- Pregnancy, corpus luteum in, 19
- death of foetus during, 646
- deficiency diseases in, 271
- diabetes in, 263
- diagnosis of, 32, 40
 - between first and subsequent, 47
- Diagnosis Station, Edinburgh, 44
- diet in, 77
- differential diagnosis of, 45
 - from ovarian cysts, 46
 - from uterine fibroids, 46
- digestive system in, 31
- diphtheria in, 215
- diseases complicating, 190
 - of blood in, 240
 - of the cardiovascular system in, 192
 - of the gastro-intestinal tract in, 267
 - of the heart and, 192
 - of the heart and treatment, 195
 - of metabolism in, 263
 - of the nervous system in, 270
 - of the placenta in, 298
 - of the respiratory system complicating, 204
 - of the skin in, 276
 - of the urinary system during, 253
- diverticulitis in, 279
- duration of, 49
- dysenteries in, 267
- eclampsia in, 165
- ectopic, 328 *et seq.*
- endocrine system in, 32
- examination during, 73
- exercise during, 79
- extra-uterine, differential diagnosis
 - from abortion, 318
- Fallopian tubes in, 28
- filariasis in, 232
- foetal heart in, 38
- frequency of micturition in, 34
- Friedman's Test in, 43
- gonorrhoea in, 220
- granuloma inguinale in, 223
- haematological examination during, 73
- haemorrhages in third trimester of, 357 *et seq.*
- height of uterus in, 74
- helminthiasis, 235
- hydatidiform mole in, 280
- hydramnios in, 289
- hyperemesis in, 150
- hypertrophy of heart in, 30
- hypothyroidism in, 265
- in uterine horn, 355
- in uterine malformations, 504
- infantile beri-beri in, 234
- influenza during, 211
- infundibular, 336
- interstitial, 332
- intestinal obstruction in, 279
- isthmial, 336
- jaundice in, 159
- kala-azar in, 228
- kidney in, 162
- leprosy in, 234
- liver changes in, 31
- lobar pneumonia in, 209
- Pregnancy, longings of, 34
- malaria in, 224
- mammæ in, 30
- maternal changes due to, 27
- measles in, 215
- melancholia in, 32
- metal hygiene during, 80
- morning sickness in, 33, 150
- multiple, 469
- nephritis in, 254
- nervous system in, 270
- obstetric examination during, 73
- oedema in, 31
- oligohydramnios in, 284
- ovarian, 329
- palpation of foetal parts, 38

- pelvimetry in, 75
 perforated gastric ulcer in, 279
 pernicious anæmia in, 244
 vomiting in, 273
 physiology of, 27
 pigmentation of skin during, 32, 38
 placentitis in, 298
 pre-eclamptic toxæmia of, 159
 pyelitis in, 31
 quickening in, 37
 relapsing fever in, 216
 relaxatin of pelvic joints in, 6
 renal colic in, 279
 respiratory system in, 31
 round ligaments in, 28
 salivation in, 34
 scarlet fever in, 214
 secondary anæmias during, 251
 serological tests in, 73
 sexual intercourse during, 80
 signs of, objective and subjective, 33 *et seq.*
 skeleton in, 32
 skin in, 32, 38
 souffle, funic in, 39
 uterine in, 39
 sprue in, 274
 surgical emergencies during, 277
 symptoms of, 33
 syphilis in, 217
 teeth in, 32, 79
 termination of, in diabetes, 265
 in eclampsia, 181
 in tuberculosis, 207
 indications for in pre-eclamptic toxæmia, 165
 methods of, 164
 thyrotoxicosis in, 266
 toxæmias of, 149
 cause of abruptio placentæ, 357
 concealed accidental hæmorrhage in, 189
 tubal, 330
 tubal gestation in, 278
 tuberculosis complicating labour, 208
 during puerperium, 209
 of lungs during, 204
 tubo-uterine, 332
 tumours and, 524
 twisted ovarian cyst in, 278
 Pregnancy, typhoid in, 213
 urinary infections in, 253
 urinary system during, 31
 urinary tract during, 253
 urine in, 34
 uterus in, 27, 35, 50
 vagina in, 28, 35
 varicosity of veins, 31
 variola in, 213
 vascular system in, 30
 vomiting in, 31,
 weight in, 73
 Presentation, abnormal, 62, 75
- anterior fontanelle, 396
 anterior parietal, 397
 breech, 64, 421
 differentiated from face, 427
 brow, 57, 395, 400
 cephalic, 57, 387 *et seq.*
 compound, 58
 cord, 459
 elbow, 447
 face, 57, 405
 foot, 422
 glabellar, 420
 hand, 447
 head and foot, 455, 458
 head and hand, 455, 457-8
 knee, 427
 oblique, 445
 pelvic, 58, 421
 posterior parietal, 399
 shoulder, 58, 447
 vertex, 57
 Presenting part, engagement or fixation of, 91
 Price-Jones' method of blood examination, 242
 Primitive streak, 22
 fold, 22
 Primordial follicles, 19
 Prolapse of umbilical cord with compound presentation, 469
 Prophylactic care, 99
 Proprietary foodstuffs, 139
 Pseudocyesis, 47
 Puberty, signs of 18
 Pubiotomy, 753
 Pubis, symphysis, 6
 Pudic artery, internal, 17
 Puerperal ascites, 840
 Puerperal infection, 767
 auto-infection, 771
 cervix in, 774
 complications in, 806
 curettage in, 800
 diagnosis of, 783
 intra-uterine douche in, 799
 pathology, 773
 pelvic cellulitis in, 778
 peritonitis in, 779
 phlegmasia alba dolens, 777, 811
 pyæmia in, 781
 pyæmic abscesses in, 810
 reproductive insanity in, 813
 salpingitis, 775, 779, 810
 Puerperal infection, spread of infection, 772
 treatment of, 791
 urinary infections in, 811
 uterus in, 774
 vagina in, 773
 vulva in, 773
 inversion of uterus, 612
 inversion, chronic, 614
 neuritis, 839
 Puerperium, abdominal wall during, 124

- after-pains during, 126
 bladder during, care of, 129
 bowels in, 128
 cancer complicating the, 545
 cardiac patients, management of during, 203
 care of patient during, 125 et seq.
 changes in breasts during, 123
 in cervix during, 123
 in external genitalia during, 123
 in uterus during, 121
 in vagina during, 123
 complicated by ovarian tumours, 541
 diet during, 127
 fibroid tumours during, 527
 fibromyomata complicating the, 527
 general condition of the patient during, 132
 lochia during, 130
 normal, 122
 perineum, care of, during, 131
 peritoneum during, 124
 physiology of, 121
 pulse during, 128
 respiration during, 128
 rest during, 127
 sleep during, 130
 sleeplessness as symptom of insanity during, 130
 temperature during, 128
 causes of rise, in tropics, 128
 Pyæmic abscesses in puerperal infection, 780
 Pyelitis, 256
 Pyelitis gravidarum, 256
 induction of labour for, 762
 Pyloric spasm, 654
 Pylorus, stenosis of, 654
 Pyometra, 800

 Radiography in contracted pelvis, 560
 in obstetric diagnosis, 847
 Ramsbottom, 712
 Rectal examination in obstetric diagnosis, 69
 Relapsing fever in pregnancy, 216
 Remington-Hobbs' treatment of puerperal infection, 799
 Renal colic in pregnancy, 279
 Renal efficiency test, 253
 Ring, contraction, 491
 retraction. *See* Bandl's Ring.
 Robert's pelvis, 591
 Roederer's obliquity, 395
 Roentgen rays in induction of abortion, 758
 Round ligaments, anatomy of, 13
 Rudimentary horn, pregnancy in, 506
 Rupture in extra-uterine pregnancy, 346
 in interstitial pregnancy, 352
 in isthmial pregnancy, 333
 of membranes. *See* Membranes,
 Rupture of
 of uterus. *See* Uterus, Rupture of

 Sacro-iliac joint, 6
 Salpingitis, 779
 acute, in pregnancy, 278
 Scarlet fever in pregnancy, 214
 Schatz's manoeuvre, 414
 Schauta's classification of contracted pelvis, 546
 Schultze's method of artificial respiration, 645
 Shock, differentiated from hæmorrhagic collapse, 364
 "Show" in labour, 105
 Simpson's basilyst, 711
 Skin, diseases of, in pregnancy, 276
 Skull, depression of, 655
 spoon-shaped deformity of, 649
 Smellie's method in breech presentation, 441
 Snuffles, 145
 Sodium evipan, 831
 Spiegelberg, 329
 Spinelli, 615
 Spondylotomy, 716
 Spontaneous evolution, 448
 version, 448
 Sprue in pregnancy, 274
 Status eclampticus, 169
 Striæ gravidarum, 28
 during puerperium, 125
 Stroganoff, 176
 Stroganoff's treatment of eclampsia, 176
 Strychnine poisoning or eclamptic fits, 171
 Subinvolution of uterus, 611
 Suprarenal glands, 842
 Sutures of foetal head, 59
 Sylvester's method of artificial respiration, 643
 Symphysiotomy, 575, 748
 Symphysis pubis, 6
 injuries to, 617
 Synchronroses, sacro-iliac, injuries to, in labour, 619
 Syphilis, congenital in the new-born child, 144
 foetal, 303
 in pregnancy, 217

 Talipes, 654
 Tarnier, 667
 Teeth, care of, in pregnancy, 79
 Temperature in eclampsia, 169
 Tent, laminaria, for dilation of the cervix, 757
 Testes, undescended, 654
 Trianus neonatorum, 149
 Thyroid, 842
 extract, 845

therapy in eclampsia, 189
 Thyrotoxicosis in pregnancy, 268
 Tongue, injury to, in eclampsia, 184
 Tongue-tie, 654
 Torsion in ovarian cysts, 537
 Toxaemia, pre-eclamptic, in pregnancy, 159
 Toxaemias of pregnancy, 149
 Transfusion of blood, 816
 methods of, 820
 selection of donor for, 818
 Transverse diameter of pelvis, 4
 lie, 445
 Trophoblast, 21
 Tubal abortion, 335
 pregnancy, 278
 termination of, 331 *et seq.*
 mole, 332
 pregnancy, abortion in, 332
 rupture in, 332
 signs and symptoms of, 338
 Tuberculosis, influence of pregnancy on, 205
 of lung, induction of labour in, 761
 Tubo-uterine pregnancy, 332
 Tumours of ovaries, complicating labour, 535
 complicating pregnancy, 535
 cystic, 535
 of uterus, 524
 Tweedy, 178
 Twins. See Multiple Pregnancy
 interlocked, 476
 Typhoid in pregnancy, 213
 Widal reaction in, 213
 Ulcer, perforated gastric, in pregnancy, 279
 Umbilical cord, anatomy of, 23
 anomalies of, 299
 in prolapse, 459
 "battledore," insertion of, 301
 haemorrhage from, 147
 knots of, 301
 ligation of, 112
 presentation of, 459 *et seq.*
 prolapse of, 459 *et seq.*
 with compound presentation, 469
 reposition of, 464
 round neck of child, 110
 velamentous insertion of, 301
 Uræmia as cause of eclampsia, 166
 in eclamptic fits, 170
 Ureters, anatomy of the, 257
 hypertrophy of, during pregnancy, 31
 Urinary infections in pregnancy, 256
 system, diseases of, in pregnancy, 256
 during pregnancy, 31
 examination of, in pregnancy, 256
 tract, physiological changes in, during pregnancy, 257

Urine, albumin in, during pregnancy, 31
 in eclampsia, 168
 in hyperemesis gravidarum, 151, 152, 156
 sugar in, during pregnancy, 31
 Uroselectan B, in diagnosis of placenta prævia, 848
 Uterine apoplexy, 368
 blood supply, 15
 contractions, intermittent, during pregnancy, 38
 true, during labour, 84, 87
 horn, pregnancy in, 355
 inertia, 485
 differential diagnosis, 489
 primary, 485
 secondary, 488
 malformations, pregnancy and labour in, 504
 tumour, cessation of growth of, 54
 Utero-sacral ligaments, 13
 Uterus, anatomy of, 11
 and abortion, 311
 anterior displacements of, ante-flexion, anteversion, 516
 bicornis bicollis, 504
 unicollis, 504
 blood supply in pregnancy, 27
 blood vessels of, 15
 body of, 503
 cancer of, complicating pregnancy, 542
 cervix of, 12
 changes in, during puerperium, 121
 in tubal pregnancy, 331
 condition of in transverse lie, 453
 contractions of, irregular, 491
 cordiformis, 503
 cornua of, 14
 corpus, of, 12
 didelphys, 504
 displacements of, 506
 endometrium of, 12
 exteriorisation of, 274
 fibroid tumours of, 45
 in differential diagnosis of retroverted gravid uterus, 511
 fundus of, 12
 Gravid, anterior displacements of, 516
 downward displacements of, 520
 replacement of, by abdominal route, 514
 sacculatation of, 515
 torsion of, 523
 height of, in pregnancy, 50
 hour-glass contraction of, with retained placenta, 608
 spasm of, 491
 hypertrophy in pregnancy, 27
 in hydatidiform mole, 282
 incarceration of, 513

- involution of, during puerperium, 121
- ligaments of, 13
- malformations of, 503
- marsupialisation of, 639
- perforation of, 326
- position of, during pregnancy, 27
- prolapse of, differentiated from chronic puerperal inversion, 615
- puerperal inversion of, 612
- retroversion of, 506
- Uterus, retroverted gravid, 51
 - confused with ruptured ectopic gestation, 346
 - differential diagnosis, 509
- rupture of, 627
 - in differential diagnosis of abruptio placentæ, 363
 - in labour, 628
 - in pregnancy, 627
 - sepsis complicating, 639
 - treatment, 634
- sacculatation of, 51
- septus, 504
- subinvolution of, 45, 611
- subseptus, 505
- tonic contraction of, 482
 - in differential diagnosis of abruptio placentæ, 363
- tumours of, 524
- unicornis, 504
- veins of, 16
- Vagina, abnormalities of, 497
 - arterial blood supply of, 16
 - atresia of, acquired, incomplete, 497
 - changes in, during puerperium, 123
 - double or septate, 498
 - fornix of, 11
 - in pregnancy, 28
 - lacerations of, 837
 - during labour, 624
 - plugging of, in abortion, 323
 - tamponade of the, 328
- Vaginal Cesarean section, 742
 - in accidental hæmorrhage, 369
 - in placenta prævia, 385
 - examination in obstetric diagnosis, 67
 - hæmorrhage in hydatidiform mole, 282
 - hysterotomy, 757
 - neoplasm, 498
 - plug in treatment of abruptio placentæ, 365
 - tamponage, 366
- van den Bergh's Test, 242
- Variola in pregnancy, 213
- Vascular system during pregnancy, 30
- Veins of reproductive organs, 16
- Venesection in eclampsia, 177
- Ventrofixation, 518
- Ventrosuspension, 518
- Version, 692
 - bipolar or combined, 693-96
 - Braxton-Hicks', 696
 - cephalic, 693
 - external, 694
 - internal, 698
 - podalic, 693
- Vertex presentation, 387
 - mechanism of labour in, 91
- Vesicular mole. *See also* Hydatidiform Mole
 - and abortion, 318
 - X-ray examination of, 848
- Vestibule, 10
- Vomiting in pregnancy, 34, 150
 - pernicious, of pregnancy, 279
- Vulva, atresia of, 495
 - cysts of, 497
 - elephantoid growth of, 496
 - injuries to, in labour, 619
 - œdema of, 495
- Vulvar outlet, abnormalities of, 495
- Walcher's position, 8, 574
- Wassermann Test, 219
 - in foetal syphilis, 303
- Weight, increase of, as symptom of pre-eclamptic toxæmia, 161
 - "Wet-nursing," 136
- Whartonian jelly, 301
- White, Clifford, 492
- Wickramasuriya, 225
- Widal reaction of blood in typhoid, 213
- Willet's forceps in treatment of placenta prævia, 382
- Williams, Whitridge, 518
- X-rays in pregnancy, 846
- Yolk-sac, 21
- Zondek-Aschheim Test. *See* Aschheim-Zondek Test

